

JPRS-CST-86-022

9 JUNE 1986

China Report

SCIENCE AND TECHNOLOGY



FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

9 JUNE 1986

CHINA REPORT SCIENCE AND TECHNOLOGY

CONTENTS

NATIONAL DEVELOPMENTS

Sino-FRG Scientific Cooperation Detailed (Li Zhongfa, Wang Aibao; LIAOWANG, 24 Feb 86).....	1
Heilongjiang Intensifies Civilian-Military Cooperation (Wei Zengrun; JISHU SHICHANG BAO, 18 Feb 86).....	4
Song Jian Urges Scientists, Technicians To Study Law (Zhu Qingfang; JISHU SHICHANG BAO, 11 Feb 86).....	5
Fund Allocation for Shanghai's Spark Plan Reported (JIEFANG RIBAO, 6 Dec 85).....	6
Effects of Technology Importation Discussed (Li Yunshu, Wan Li; KEXUEXUE YU KEXUE JISHU GUANLI [SCIENCE OF SCIENCE AND MANAGEMENT OF S&T], No 2 1986.. ..	7
Conference on Using Foreign Funds To Import Technology (TIANJIN RIBAO, 7 Nov 85).....	12
Stronger Control of Technology Markets Discussed (Zheng Haining; GUANGMING RIBAO, 5 Dec 85).....	14
Advances in Hunan, Guangdong, Shanghai Technology Markets (GUANGMING RIBAO, 6 Dec 85).....	16

Tianjin's Experience in Technology Import Work (Ma Junxin; JISHU SHICHANG BAO, 11 Feb 86).....	18
Steady Growth of Tianjin's Research Institutions Discussed (JISHU SHICHANG BAO, 18 Feb 86).....	20
Chongqing's Thriving Technology Market Described (Huang Wenfu; RENMIN RIBAO, 3 Mar 86).....	21
Anhui's S&T Successes During 6th 5-Year Plan Reported (Tang Shangru; ANHUI RIBAO, 25 Dec 85).....	23
Hebei's Research Institutes Scored 'Pleasing' Results in 1985 (HEBEI RIBAO, 13 Feb 86).....	25
Hebei's Success in Using S&T To Aid Poor Reported (HEBEI RIBAO, 28 Dec 85).....	26
Hunan Successfully Popularizes S&T Achievements (JISHU SHICHANG BAO, 18 Feb 86).....	28
Jiangsu's 'Impressive' S&T Achievements Detailed (JISHU SHICHANG BAO, 18 Feb 86).....	29
Technical Advances in Jiangsu Local Economy Reported (RENMIN RIBAO, 18 Jan 86).....	30
Technical Investment in Jiangsu Reported (RENMIN RIBAO, 18 Jan 86).....	32
Shanxi's S&T Contingent Development Reported (Liu Chanhai, Ren Yuanming; SHANXI RIBAO, 19 Dec 85).....	33
Ningxia Science, Technology Organizations Discussed (Liu Changming; NINGXIA RIBAO, 16 Nov 85).....	34
Theoretical Model for S&T Reform Discussed (Hu Shilu; KEXUEXUE YU KEXUE JISHU GUANLI [SCIENCE OF SCIENCE AND MANAGEMENT OF S&T], No 2, 1986).....	36
Enterprises' Lack of Enthusiasm for Technology Purchases Viewed (Ge Yushua, Li Yuming; JISHU SHICHANG BAO, 18 Feb 86).....	41

APPLIED SCIENCES

New Accelerator To Boost Nation's Nuclear Physics Research (RENMIN RIBAO (OVERSEAS EDITION), 11 May 86).....	46
Training Simulator Technology Used in China's Armed Forces (Xiao Hao; XIANDAIHUA [MODERNIZATION], No 2, 1986).....	47

ABSTRACTS

COMPUTERS

XIAOXING WEIXING JISUANJI XITONG [MINI-MICRO SYSTEMS]
No 9, 8 Sep 85..... 50

XIAOXING WEIXING JISUANJI XITONG [MINI-MICRO SYSTEMS]
Nos 10-11, 8 Nov 85..... 54

NUCLEAR FUSION

HUJUBIAN YU DENGZIZITI WULI [NUCLEAR FUSION AND PLASMA
PHYSICS] No 1, 15 Mar 86..... 56

PHYSICS

HONGWAI YANJIU [CHINESE JOURNAL OF INFRARED RESEARCH]
No 1, Feb 86..... 64

WULI XUEBAO [ACTA PHYSICA SINICA] No 2, Feb 86..... 67

THERMOPHYSICS

GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS]
No 3, Aug 85..... 72

/12223

NATIONAL DEVELOPMENTS

SINO-FRG SCIENTIFIC COOPERATION DETAILED

HK Beijing LIAOWANG in Chinese, 24 Feb 86 pp 35-36

[Dispatch from Bonn by special contributors Li Zhongfa [2621 6786 4099] and Wang Aibao [3769 1947 1405]: "A Cooperative Relation Filled with Mutual Trust--FRG Research and Technology Minister of Scientific and Technological Cooperation with China"]

[Excerpts] First the unassuming minister Heinz Riesenhuber gave us a briefing on the general situation in Sino-FRG scientific and technological cooperation.

Sino-FRG scientific and technological cooperation "is still at the stage of infancy, but it grows very quickly." With these words, he summed up the present situation of scientific and technological cooperation between the two countries. In a short period of several years, the FRG has already become one of China's most important partners of scientific and technological cooperation, and China has already become the Third World country that has the most wide-ranging and most quickly developing scientific and technological cooperation with the FRG. Since the governments of the two countries signed a scientific and technological cooperation agreement in October 1978, the scientific and technological cooperation between the two countries has continued to deepen and widen and heartening achievements have been scored. The two sides have already concluded 37 counterpart cooperation agreements between ministries and between scientific research units and agreements on large scientific and technological cooperation projects. The scope of scientific and technological cooperation has been extended from 11 fields including energy, materials, aviation, electronic technology and production technology to 15 fields including nuclear energy and astronautics.

In the geological, metallurgical, nonferrous metals and astronautical fields, the responsible departments of the two sides meet every year to discuss the cooperation projects in their respective fields. In the fields of basic research, aviation, weights and measures, and electronic technology, the counterpart scientific research institutes of the two sides meet periodically to draw up their cooperation plans. The methods of cooperation between the two sides have gradually developed from the previous methods of merely exchanging data and general exchange of inspection visits to the methods of joint research, cooperation in testing, joint prospecting, joint designing, technological consultation, joint academic symposiums, and cooperation in research between the scientific research institutes of the two sides.

Riesenhuber said that the FRG attached very great importance to intensifying its scientific and technological cooperation with China. Over the past few years, the FRG has already provided nearly 50 million Deutsche Marks of funds for 35 cooperation projects. From 1985 to 1986, the FRG provided 1 million Deutsche Marks to fund the exchange of scientific and technological personnel between the two countries. Under the common efforts of the two sides, great successes have been achieved in many cooperation projects, such as the energy redistribution research in Guangdong province, the energy utilization project in Daxing County, Beijing, and the production management modernization in Shenyang First Machine Tools Plant. The two sides have also scored market achievements in their cooperation in the fields of basic research, energy, materials and electronic technology.

When he talked about the prospects for the scientific and technological cooperation between the two countries, he smiled and looked full of confidence. He said that China has an almost boundless demand for infrastructure (communications, city and district planning, post and telecommunications, energy supply, waste water processing, and so on), has scored outstanding achievements in many fields of scientific research and has scientists and specialized workers whose ambition and working spirit are worth praising; on the other hand, the FRG has a relatively strong scientific research work force, the technological quality of its industrial products is relatively high, and the FRG industrialist circles are also willing to conduct wide-ranging technological transfer, help China train personnel, and set up joint venture enterprises. This constitutes a firm foundation for the scientific and technological cooperation between the two countries. Therefore, Riesenhuber suggested that the two countries should fully tap the potential of wide-ranging cooperation.

Riesenhuber said that scientific and technological cooperation is now developing in wider spheres with more advanced technology. For example, they have reached agreements or are holding talks concerning the cooperation in the extraction of protein, oceanographic research and technology, environmental research and technology, utilization of nuclear energy to provide heat to cities, electronic technology, and information technology.

When we asked him whether there was any problem in the scientific and technological cooperation between the two countries, with fervor and assurance, Riesenhuber immediately said that there was no problem or trouble in our cooperation. He said that our cooperation was carried out on the basis of a partner relationship and was filled with the spirit of friendship and mutual accommodation and respect. The relationship of mutual trust between the two sides has already been written into the history of the scientific and technological cooperation between the two countries.

Riesenhuber is now the youngest minister in FRG government. He graduated from the Frankfurt University, majoring in chemistry. In addition, he is quite accomplished in both national economics and philosophy. In order to better turn scientific research achievements into productive forces, he conscientiously upholds pushing forward the economic cooperation between the two countries through scientific and technological cooperation. He said that Chancellor Helmut Kohl's visit to China in October 1984 and Premier Zhao

Ziyang's visit to the FRG in June 1985 have greatly promoted the economic cooperation between the two countries. Last year alone, the governors of about half of FRG states visited China. A common characteristic of all these visits was that they all promoted economic cooperation between the two countries.

Riesenhuber said that China satisfactorily calls the second phase of the Baoshan Iron and Steel Project as an example of the cooperation between the two countries. He stressed: "We should not think this is enough. We are willing to carry out more projects like Baoshan with China. We will always better carry on Baoshan's cooperative spirit in all other projects including the projects to provide Southern Jiangsu with equipment for a nuclear power station and to provide satellite technology."

/12913

CSO: 4008/2078

NATIONAL DEVELOPMENTS

HEILONGJIANG INTENSIFIES CIVILIAN-MILITARY COOPERATION

Tianjin JISHU SHICHANG BAO in Chinese 18 Feb 86 p 1

[Article by Wei Zengrun [7614 1073 3387]: "Heilongjiang Stresses Greater Civilian-Military Cooperation During the Seventh 5-Year Plan"]

[Text] Heilongjiang's defense science and technology sector has conscientiously carried out the work related to the development of civilian products, technology transfer, and technological advice and consultation. During the Sixth 5-Year Plan, it produced more than 40 civilian products, of which 10 have become key civilian products, including bicycles (made of aluminium alloy), industrial sewing machines, steel tanks for liquidized petroleum gas, light automobiles, washing machines, light automobiles, high pressure gas cylinders (made of steel or aluminium), engines for light automobiles, shaped copper and shaped aluminium. Capacity for the production of these products has already taken shape and great economic results have been achieved.

In order to give full play to the advantages and tap the potential of its defense industry, Heilongjiang's defense industrial sector has put forth a magnificent plan during the Seventh 5-Year Plan. The sector will yield more than 3.5 billion yuan of civilian output value and develop 10 more key civilian products, such as plastic products, machinery for making plastic products, tools for making plastic goods, heavy automobiles and their variations, levelling machines, elevators, motor cycles, beer, oil rigs, and precision hard metal alloys. It will also conscientiously carry out the work of transferring military technology to civilian production, and has already sorted out about 1,000 kinds of technology that can be transferred to civilian production. It has formulated a "spark plan" to jointly carry out "short-term, level and speedy" projects, such as gold exploitation and the fixing and manufacturing of gold exploitation equipment. In addition, it will intensify lateral cooperation, conduct specialized coordination, and give full play to the role of the various kinds of specialists in its defense industrial colleges and universities and scientific research units. At the request of its customers, it will provide designing service for new projects, technological transformation projects and special equipment, help tackle technological hurdles, provide technological advice, and train personnel. Heilongjiang Province's national defense industry will intensify its efforts and strive to reinvigorate China during the Seventh 5-Year Plan.

/12913

CSO: 4008/2079

NATIONAL DEVELOPMENTS

SONG JIAN URGES SCIENTISTS, TECHNICIANS TO STUDY LAW

Tianjin JISHU SHICHANG BAO in Chinese 11 Feb 86 p 1

[Article by Zhu Qingfang [2612 1987 5364]: "Song Jian, Minister in charge of the State Science and technology Commission, Calls on Scientific and Technological Circles to Study Law"]

[Text] At the recent work conference of the State Science and Technology Commission, Song Jian, minister in charge, called on all the workers of the commission and in the scientific and technological field to study law conscientiously in the course of strengthening the construction of our spiritual civilization and to become models in observing the law.

Song Jian said that our party's goal is to build a modern socialist country with highly developed civilization and democracy. Law is an important constituent part of modern civilization and also an important symbol of high level of democracy. Last year, the CPC Central Committee decided that in 1986 we should popularize knowledge of law on a national scale, every citizen should study this knowledge, and leading cadres should study even better. Ours is a big country with 1 billion people and hundreds and thousands of lines of trade. Without regulations, rules or laws to govern our work, there will be no guarantee for the interests of our people and state. Therefore, we all should happily accept the restrictions of laws; otherwise, it will be impossible for civilization or democracy to exist. Song Jian also explained the meaning of freedom. He said that freedom meant the right to do all the things allowed by the law. If one does a thing forbidden by our law, he will no longer have freedom because he has harmed the interests of the people and state. In his speech, Song Jian also stressed that one of the important reasons for some of the problems that have cropped up in our scientific and technological circles at present is that some people do not understand, attach importance to or observe law. The leading groups at all levels must pay close attention to this. Song Jian called on all the comrades in our scientific and technological circles to study, become familiar with, and observe our law. We should make everyone understand what he is allowed to do and what he is not. All scientific research institutes should set examples in observing our law. All independent science and technology institutions should employ full-time lawyers and have experts specialized in law to help their work. This should become a set practice and a habit. They should by no means do anything against the law, otherwise, their fine words about science and technology will become useless in the face of law.

NATIONAL DEVELOPMENTS

FUND ALLOCATION FOR SHANGHAI'S SPARK PLAN REPORTED

Shanghai JIEFANG NINBAO in Chinese 6 Dec 85 p 1

[Text] Shanghai's "Spark Plan" has already been drawn up. For the period of the Seventh 5-Year Plan, the Municipal Committee on Science and Technology is prepared to take 7,000,000 yuan annually from the three Science and Technology funding lines to implement "The Spark Plan" for the purpose of implanting a new science and technology embryo in order to develop the local economy. The "Spark Plan" is an important national scientific and technological task for the period of the Seventh 5-Year Plan. Its purpose is to combine scientific and technological work even more closely with the economy to raise the scientific and technological level of medium and small enterprises, township and town enterprises, and agricultural village construction, thereby developing the local economy. On the basis of Shanghai's lack of resources, and on the practical situation of its having a certain superiority in technology and talent, the Municipal Party Committee on Science and Technology has, besides submitting the 22 topics in the "Spark Plan," recently drawn up a "Spark Plan" for the Shanghai Municipality for 1986 to 1987. Arrangements have been made for the first batch to include 12 topics: napped cloth, feed solid dry yeast, mustard acid, fast growing cypress, emulsified essences, Chinese medicinal tonic drinks, solar panels, handcraft hats, [diethyl para phenylene], [succinic acid ester fibers], glass wool blankets, GC high-speed sewing machines, and graft paper pulp. All of these topics provide significant economic benefit. It is estimated that annual production will increase by 118,390,000 yuan, taxes by 32,010,000 yuan, and 19,590,000 yuan in foreign exchange will be conserved or set up. The total to go into production will be approximately 21,380,000 yuan. Its emphasis is on serving export and earning foreign exchange, actively supporting as well as organizing and arranging the conversion into export commodities of a batch of scientific and technological accomplishments, simultaneously arranging a batch of topics to save foreign exchange, reducing or ceasing the import of raw materials, parts, or equipment; developing or furnishing technology for medium and small enterprises as well as townships and towns, organizing digestion, absorption, and production for equipment in high demand or in fixed quantities, to fulfill the developmental requirements of medium and small enterprises as well as township and town enterprises; to develop the resources of the suburban counties of Shanghai and develop vigorously economic services for the suburban counties, to emphasize the arranging of developmental projects directly related to the daily lives of the people of Shanghai such as vegetables, fish, eggs, domestic animals, etc.; and to serve such projects as providing complete sets of equipment for industries or providing small commodities with innovations for the marketplace.

NATIONAL DEVELOPMENTS

EFFECTS OF TECHNOLOGY IMPORTATION DISCUSSED

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENCE OF SCIENCE AND MANAGEMENT OF S&T] in Chinese No 2, 1986 pp 8-9

[Article by Li Yunshu [2621 6663 5289], Baotou City Institute of Scientific and Technical Information; Wan Li [8001 0500], responsible editor: "The Effects of Importation of Technology on Science and Technology and Economic Development"]

[Text] With the continued thorough implementation of our open-door policy, the effects of using foreign funds and imported technology in the development of science and technology and in the economy is becoming greater and more and more obvious. Therefore, many provinces and cities in China wish to use foreign funds and import even more technology to accelerate the development of local science and technology and the economy. In 1984, after Baotou was listed as one of the larger cities in China, a means was established in the Shenzhen special economic zone for the importation of technology through an investment by local financing of 1 million yuan. Basing this paper on the situation regarding the effects of importing technology in the Shenzhen special economic zone on science and technology and economic development, I mention some of the problems that should be considered when importing technology.

1. Technology is a commodity, so importing technology is a form of technology trade. What I mean by technology trade is similar to the international licensing trade, that is, a transfer at a price of the rights to technology. The matter of transfer of the rights to technology may be divided into patents, technology secrets, and trademarks. Since technology trade is a kind of trade, many trade-related questions must be studied, as for example trade policies, trade conditions and means, and ordering methods. But at the same time it is a means for the transfer of rights to technology, and therefore there are also many technical questions to be considered, as for example the selection of items and analysis of the degrees of advancement and of the economy, the technology to be imported and the technical conditions in the importing country, and methods of implementation and results of applications, as well as absorption and improvement after importation. People in relevant international societies have pointed out that technology trade concerns the various aspects of technology, economy, law, operations, and management, and that the process itself of transforming the technical knowledge of one country

into actual production in another country is a complicated technology and branch of learning.

Because of the increasingly important decisive function of science and technology in development of the economy, the development of technology trade might be even more apparent than the development of trade for any one commodity. The substance of technology trade is international specialization in scientific and technical research, and is also the direct result of scientific and technical advances because the large scale investment needed for even higher level scientific and technical research often exceeds the capacity of a nation or firm. Which brings about international specialization in science and technology research. This international specialization in scientific and technical research is the most essential characteristic in future international sharing of labor. Trade in patent rights and licensing is a result of this division of labor.

After the second world war, scientific and technical development was extremely rapid. Consequently, the development of technology trade has been extremely rapid, and has become as well an important form of international trade. According to United Nations statistics, 1985 volumes for world technology trade could reach \$40-50 billion dollars. In the past, technology trade was centered in developed countries, and especially in the United States, England, France, Japan, and West Germany, but in recent years a small number of developing countries, as for example India, Argentina, and China, have also begun shipping technology out, even exporting entire sets of equipment.

II. In 1979, China decided to establish a special economic zone in the city of Shenzhen, important goals for which were to use foreign investment, import advanced technology and management methods, and allow the special economic zones to build toward rapid development, and also to serve the "drive toward modernization" and to allow it to become for the whole country "a window of technology, a window of knowledge, a window of management, and a window for an open-door policy." Since establishment of the Shenzhen special economic zone, importation of technology has developed rapidly, and from 1979 through 1983 there were 2,282 agreements signed with customers from more than 10 nations and regions regarding industry, commerce, agriculture, real estate, transportation and shipping, and travel, as well as with other businesses. Actual foreign investment has been \$2,316,880,000 [Hong Kong dollars]. There were 22 projects involving \$100 million [Hong Kong dollars] or more among them, and 63 that involved \$10 million [Hong Kong dollars] or more.

Looking at this from the point of view of investment by business: industry has the most, 1,718 projects in all, with an actual investment of \$1,053,520,000 [Hong Kong dollars]; commerce had 81 projects, for an actual investment of \$119.23 million [Hong Kong dollars]; 375 projects in agriculture, for an actual investment of \$132.07 million [Hong Kong dollars]; 58 real estate projects, for an actual investment of \$664.26 million [Hong Kong dollars]; 18 transportation and shipping projects, for an actual investment of \$26.93 million [Hong Kong dollars]; 13 projects in tourism, for an actual investment of \$123.42 million [Hong Kong dollars]; 19 projects in other businesses, with an actual investment of \$197.45 million [Hong Kong dollars].

Looking at modes of investment: 76 projects were jointly funded and operated, for an actual investment of \$236.56 million [Hong Kong dollars]; 211 were cooperatively managed, for an actual investment of \$1.26630 billion [Hong Kong dollars]; 37 were independently funded and operated, for an actual investment of \$298.64 [Hong Kong dollars]; 5 were for compensation trade, for an actual investment of \$9.160 million [Hong Kong dollars]; and there were 1,953 projects for processing and assembly and for processing of imported materials, for an actual investment of \$506.22 million [Hong Kong dollars].

Importation of technology in Shenzhen went through a process by which it developed from a low-grade form to a high-grade form, that is, a process by which it developed from processing and assembly and processing of imported materials to compensation trade, and even joint funding and operation, to form advanced, intermediate, and still backward hierarchical technology and industrial structure. With the development of the special economic zones and constant perfection of base structures, there will be importation of even more advanced technology, and labor intensive enterprises will develop toward capital intensive and technology intensive enterprises.

For 4 years now, the Shenzhen economic zone has absorbed foreign investment and imported advanced technology and equipment, which has not only accelerated advances in science and technology, but has also promoted economic development, and has brought about an enormous improvement in the lives of the people. The gross industrial output value from Shenzhen in 1982 reached 359 million yuan, a nearly fivefold increase over 1978 and an average annual growth of nearly 100 percent; per capita annual industrial labor productivity was 177 million yuan, a growth more than double that of 1978. For agriculture throughout the city in 1982, per capita allocation was 393 yuan, 2.9 times that of 1978, and of 238 agricultural brigades throughout the city 9 had per capita allocations of 1,000 yuan and up. More than 2,300 households had total incomes of over 10,000 yuan. Tax revenue in the city of Shenzhen in 1982 was 163 million yuan, a growth of 25.4 percent over 1981. In 1982 more than 15,000 people found employment, and 400,000 sq m of new housing area was built. Current per capita living area is 9.6 sq m which is rather spacious among cities throughout the country.

III. The situation regarding the importation of technology in the Shenzhen special economic zone shows that the effects on science and technology and on economic development of the importation of technology have truly been enormous, and that it has served to promote science and technology and economic development has been quite obvious. Use of foreign investment, the importation of technology, and expansion of foreign trade are important matters in China's open-door policy. Our open-door policy is a long-term strategic principle, and therefore the importation of technology is also a long-term strategic principle for China. It has been of important strategic significance for the conservation of manpower, material power, and financial power, for winning time and exploiting international markets, for promoting advances in science and technology and in economic development, for realizing the strategic goals of quadrupling gross output value, for accomplishing the great mission of the "four modernizations," and for improving the people's standard of living.

To further the work in importing technology and to accelerate the development of the economy in this country, I believe that we should concentrate on solving the following few problems:

1. Improve ideological understanding. We should overcome the effects of "leftist" thinking and raise the importation of technology to a high degree of understanding as being a long term strategic policy of this country, and we should include this effort as an important item on the agenda for party committees and governments at all levels. It should become a focus, for which leadership should be strengthened.

2. Open up more. After China established 4 special economic zones, we also resolved to open up 14 coastal cities, which was a deepening and expansion of our open door policy. But in some provinces and cities in the interior, and especially some of the border regions, the tendency to keep things locked up has not yet changed, and success at opening up has been insufficient. On the heels of our four special economic zones and the 14 opened coastal cities, we should move to open up the largest and larger cities in this country and should formulate some preferential and flexible policies and appropriately expand their authority to more effectively attract foreign investment and import technology; at the same time, we should fully use the windows that are the special economic zones and the opened coastal cities to import from abroad while uniting within and enhance lateral relations to allow the importation and absorption of the technologies in these regions to move as quickly as possible toward cities in the inland. In general, we should change from an "inward" economy to an "outward" economy, which would allow the advanced technologies of our eastern coastal regions to unite with the abundant resources of the inland areas, for mutual promotion and the exploitation of advantages.

3. The importation of technology touches both upon the economic system and the science and technology system, and if we are to do this work well then we should arouse the enthusiasm of departments of industry, science and technology, and foreign trade, and especially the close cooperation between units of economics and science and technology commissions and offices of foreign trade, to thoroughly achieve industrial and trade integration and the integration of technology with trade.

4. In the past, there have been errors in the areas of the importation of technology and equipment. Chiefly, these have been the excessive importation of entire sets of equipment, duplicate importation, and too little concern for the importation of advanced technologies, nor have these things been well absorbed or assimilated. From now on, we ought to primarily import technology and import only that key equipment that China cannot manufacture. We should not import whole sets of equipment, we should not import things in duplicate, and we should not import things that cannot then be assimilated and disseminated. Importing technology should serve the technical transformation of current enterprises. The forms of importing should less often be assembly of imported components and processing of imported materials, but should be more often in the forms of joint funding and operations, cooperative management, or compensation trade. At the same time as we develop basic industries, we should pay attention to developing capital intensive and

technology intensive enterprises; at the same time as we focus on the development of industry, we should pay attention to the corresponding development of commerce, transportation and shipping, real estate, travel, and agriculture, animal husbandry, and fishing.

5. Enhance work in science and technology information and economic information, do a good job at selection and justification of import projects, collect and analyse information on advanced technology, market pricing, and imported technology, work toward making information available, toward dealing with it in a timely manner, and being familiar with it, and avoid blind importation, being cheated, and committing errors.

12586

CSO: 4008/2088

NATIONAL DEVELOPMENTS

CONFERENCE ON USING FOREIGN FUNDS TO IMPORT TECHNOLOGY

Tianjin TIANJIN RIBAO in Chinese 7 Nov 85 p 2

[Text] Yesterday the Municipal Government convened a conference to exchange experience in the use of foreign funds by our city's scientific research units in the introduction of technology. The Paper Manufacturing Research Institute, the Textile Industry Research Institute, the Computation Center, the New Technology Development Corporation, and the Tianjin Great Northern Ocean Development Service Corporation made presentations on their experience. Yang Jingheng [2799 4552 5899] of the Standing Committee of the Municipal Party Committee and Li Lanqing [2621 1526 3237], the Deputy Mayor, both delivered remarks.

During his remarks, Li Lanqing stated that, while being more open outwardly, scientific research units should combine their own scientific research achievements with imported advanced technology and devote effort toward digestion, absorption, and innovation. He pointed out that the sphere for scientific research departments to use foreign funds to import technology is very expansive. For example, they could cooperate with foreign scientific research units, universities, and corporations to exchange and disseminate scientific research information and advice, develop new products and technology, transfer technology, develop and transfer software, contract for engineering design, and train and furnish talent to set up joint ventures with production enterprises and foreign businessmen and to help them digest, absorb and raise the level of imported technology and so on. He also clarified channels and methods for the scientific research departments, hoping that all concerned would set records in this area.

Yang Jingheng stated in his remarks that scientific research units should continue to the transformation, from inwardly oriented to outwardly oriented, scientifically researching how to change forms; creating multiple forms; developing channels for foreign trade in science and technology and for joint funding and cooperation; to deal precisely with the relationship between internal development and the importation of technology; to stress economic benefit in all commercial science and technology and exchange activity; to

deal correctly with the problem of opening outward and the security of technology; and that a group of science and technology troops be cultivated who have the knowledge, understanding of foreign languages, adeptness in negotiation, and the ability to develop foreign trade activity.

Deputy Mayor Yao Jun [1202 1498] also attended the conference.

8174

CSO: 4008/2041

NATIONAL DEVELOPMENTS

STRONGER CONTROL OF TECHNOLOGY MARKETS DISCUSSED

Beijing GUANGMING RIBAO in Chinese 5 Dec 85 p 1

[Article by Zheng Haining [6774 3189 1380]: "Strengthen Control over Technology Markets to Promote Healthy Development"]

[Text] On 12 December a responsible person from the State Science and Technology Commission gave a talk to reporters on the situation facing our country's technology market as well as how to further control the technology market, promoting the health and development of the technology market, and other questions.

This responsible person stated that a new situation of vigorous growth appeared in our country's technology market this year, which strongly promoted the transfer of technology and the spreading of the application of technological achievements to production. Recently, however, a problem was discovered which deserves attention: interference with the normal development of the technology market. At present we must adhere firmly to the direction of restructuring, further opening technology markets and continuing to implement the guidance: "Open, vitalize, foster, guide," ensuring the healthy development of the restructuring of the scientific and technological system.

He pointed out that all areas and all departments must earnestly strengthen the leadership of the technology market, establishing and strengthening essential management control systems. Technology markets may take many forms and uniformity should not be forced; participation in interchange activity should be voluntary and not forcibly ordered; it should be discussed in terms of practical effect rather than formalism. Technology transferred in the technology market should be mature technology or a phased technological achievement, with the transferer explaining the level of maturity of the technological achievement realistically, not exaggerating, and not resorting to deception; plagiarizing of others' achievements and encroaching upon others' economic rights are forbidden, as is the transferral of technology in violation of national law or policy requirements. In the case of technology which must be safeguarded because of national security or major economic benefit, transferral should be handled in accordance with national regulations pertaining to the security of science and technology.

He emphasized that, when trading in technology, both seller and buyer must, on the basis of a serious, earnest, and responsible attitude, furnish the pertinent details of the situation to the other party in practical fashion, and on the basis of the concurrence of both parties, sign and abide by the technological contract prepared in accordance with pertinent regulations. Besides having the pertinent technical content, the contract must clearly specify the rate of progress of the work; the expense budget; the rights and responsibilities of buyer, seller, and intermediary; price or remuneration; the method of payment; test and acceptance standards and methods; the ownership and enjoyment of technological achievements; responsibility for violations of the agreement and so on. The economic ability of the recipient to support technology should be given adequate consideration in setting the price of technological commodities. All income from technology transfers should be tax exempt in the near term, and a portion taken to reward personnel directly engaged in the developmental work, with funds for the awards excluded from the unit's budget for incentive awards. During a fixed time limit, new products should enjoy the benefit of reduced taxes.

He finally pointed out that, on the premise of completing their assigned work and nonencroachment upon the unit's technological rights and economic benefit, scientific and technological personnel may conduct appropriate technological work and consultant services in their spare time, retaining the income from such activity; and, when the unit's technological accomplishments and internal technological information and equipment are utilized, concurrence of the unit is required, and a portion of the income turned in to higher authority. Salaries, treatment, and technical duties of scientific and technological personnel working in management agencies related to the technological market and other scientific and technological personnel engaged in technological management activity should be treated equally without discrimination.

8174
CSO:4008/2041

NATIONAL DEVELOPMENTS

ADVANCES IN HUNAN, GUANGDONG, SHANGHAI TECHNOLOGY MARKETS

Beijing GUANGMING RIBAO in Chinese 6 Dec 85 p 1

[Text] Seven units including the State Science and Technology Commission, the National Defense Science, Technology and Industry Commission, the State Education Commission, and the State Statistical Bureau, recently indicated clearly regarding the investigation of the situation of the technology markets of Hunan Province, Guangdong Province and the Shanghai Municipality that our country's technology markets have already manifested a lively new situation, and constitute a bridge from science and technology to the economy.

Since the promulgation of the Central Committee's decision to restructure the science and technology system, many levels, many channels, and many forms of technology exchange in Hunan Province, Guangdong Province, and the Shanghai Municipality have made unprecedented leaps forward. Based on incomplete statistics, over 850 first-level technology exchange structures have appeared in these areas. Various types of joint ventures and integrated bodies formed by providing technology as a share have been springing up vigorously, with more than 460 in Hunan Province alone. Technology development service agencies in many prefectures have formed networks, individually becoming strong front armies, and also exhibiting a competitive aspects. In addition, some prefectures have sponsored technological and economic talks and exchange activity in Hong Kong as well as abroad, importing foreign capital and technology, promoting technological development and technological reform. Foshan, for example, by taking advantage of its many compatriots from Hong Kong and Macao and its many overseas relatives, sponsored talks in Hong Kong on the introduction of technology and economic cooperation, signing up to \$500 million dollars in contracts and letters of intent with overseas Chinese and foreign businessmen.

Since the opening of the technology market, practice has shown that the technology market has efficiently promoted the development and flourishing of city and township economies, and also brought life and vitality to scientific and technological work itself. The Changsha City Science and Technology Development Center, for example, actively participated in attacking difficult technical problems, technical consultation and other technology exchange activity directed toward medium- and small-scale enterprises as well as township and town enterprises. That center organized four instructors who in 1 1/2 years completed the major technical task of an aluminum and magnesium

alloy for a luminescent substance for Liuyang's fireworks, making fireworks the premier industry of Liuyang county with annual production over 100 million yuan. The opening of technology markets also brought life to scientific research units. According to statistics of the 45 higher institutes in the Shanghai Municipality, since the opening of the technology market, technical income of these higher institutes has increased from the 7 million yuan of 1982 to 30 million yuan in 1984 and to 3.6 million yuan for the first half of 1985. The opening of the technology market has expedited the progress of the transformation of scientific research achievements into production capacity. In the Shanghai Municipality before the technology market had been formed, for example, the transfer ratio of scientific research achievements was only 20 to 30 percent, while of the 1,585 achievements in the 1984 statistics of that municipality's Economic Committee, 834 had been transferred.

8174

CSO: 4008/2041

NATIONAL DEVELOPMENTS

TIANJIN'S EXPERIENCE IN TECHNOLOGY IMPORT WORK

Tianjin JISHU SHICHANG BAO in Chinese 11 Feb 86 p 1

[Report by Ma Junxin [7456 0193 9515]: "Tianjin's Experience: the Way to Do a More Thorough Job in Technology Input Work Is to Concentrate on Developing Enterprises' Capability for Redevelopment"]

[Text] Since last year, while concentrating on putting technology import projects into operation, the Tianjin Economic Committee has paid close attention to grasping the work of digesting, assimilating and further developing the imported technology. Currently, more than 30 of Tianjin's enterprises with imported technology have acquired the capability to redevelop their products, equipment and technology. The city has thus opened a new path for assimilating and importing technology.

Since 1983, Tianjin has signed a total of 684 contracts with foreigners worth US\$612.88 million. Last year, it focused on actually putting imported technology projects into operation. It put 202 projects into production that very year to produce 473 new varieties of products, of which 89 were exported to earn US\$40 million.

In the process of importing technology, Tianjin has paid particular attention to developing its enterprises' capability for redevelopment, and thus turned more than 30 of its enterprises with imported technology into bases for the development of new technology. Tianjin's Jinhua Radio Factory is a factory specialized in producing audio recorders. In the past, it could only assemble imported foreign components, but over the past few years, as it has clarified the orientation of its technological transformation, it has imported technology from abroad and gradually acquired a capability to redevelop their products. It has conducted joint ventures with medium-sized and small Japanese enterprises to develop new products, to draw help from foreign technology, and make full use of its own equipment. As a result, it can develop and put into production 3 to 5 new varieties of products a year and thus made it possible for our country to update its production of audio recorders. At present, the factory can put 5 percent of its products on the international market. Some factories have acquired the capacity to develop advanced equipment. For example, the Electroacoustic Equipment Plant which has produced loudspeakers for many years, has jointly designed, together with a Japanese factory specialized in producing equipment, a high-level production line that meets our national conditions. It has very quickly become able to

independently produce this production line and can now provide equipment for similar factories in our country. Many factories have acquired the capacity to transfer technology on the basis of importing, assimilating and redeveloping technology. Some of them have sold their products in various countries in the world and achieved marked economic results.

/12913

CSO: 4008/2078

NATIONAL DEVELOPMENTS

STEADY GROWTH OF TIANJIN'S RESEARCH INSTITUTIONS DISCUSSED

Tianjing JISHU SHICHANG BAO in Chinese 18 Feb 86 p 1

[Article: "Through consolidation, reform and lateral cooperation, Tianjin's Scientific Research Institutions Develop Steadily"]

[Text] During the Sixth Five-Year Plan, Tianjin steadily developed its scientific research institutions and made contributions to the invigoration of its economy.

First, a comprehensive consolidation was carried out in all the 92 research institutes in the city. By the end of last June, all of them had been checked and accepted by the state. These institutes won 35 State Invention Awards, of which 15 were won by the research projects of specialized research institutes. Currently, 15 of the research institutes are conducting joint ventures of development and research with foreigners. Eighteen of the institutes have become technological development or measuring and testing centers for the city, north China, or the nation as a whole, and four of them already have the approval of the State Council to become state-level product quality checking and testing centers.

At present, 26 research institutes have begun to carry out reform one after another and have scored marked achievements. The net income over the past 2 years reached 31 million yuan and the allocation of funds for these institutes was reduced by 3.03 million yuan. Last year, six research institutes became self-supported. Moreover, Tianjin already has over 110 joint scientific research, education and production entities, of which 8 joint scientific research and production entities in light, electronic, chemical, and textile industries alone add over 50 million yuan to Tianjin's output value and over 10 million yuan to its tax payments and profits a year.

/12913

CSO: 4008/2079

NATIONAL DEVELOPMENTS

CHONGQING'S THRIVING TECHNOLOGY MARKET DESCRIBED

Beijing RENMIN RIBAO in Chinese 3 Mar 86 p 3

[Report Huang Wenfu [7806 2429 4395]: "Technology market unprecedentedly thriving in Chongqing City"]

[Text] At present, there are already 167 organizations working to open up the technology market in Chongqing. They are scattered in the city, districts, counties and some enterprises and institutions and form an open technology market network with diverse levels and wide and deep connections. Last year, the city held and participated in 35 large-scale technological achievements exchange and trade fairs and concluded some 1,100 contracts of technology transfer worth over 85 million yuan.

As far back as in 1979, Chongqing began to carry out compensatory transfer of technological achievements on a trial basis. During the experimental reform of the science and technology system, the city regarded opening a technology market and turning technological achievements into commodities as a key link. It paid attention to widely developing a technological market in diverse, flexible forms. For example, it held city-wide technological achievements trade fairs, organized urban units to go to the countryside and market technology in rural fairs, allowed its scientific research units to open their doors widely and set up technology markets on their own, set up technological cooperation networks among its enterprises, set up joint scientific research and production associations to facilitate technology transfer and organized the export of technological achievements. By so doing, it has organically combined the scattered scientific research forces and the scientific and technological achievements of various scientific research units and initially formed a technology market system that is geared to the needs of society, production and enterprises. Some of these technology markets are permanent, but others are not. Some of them are run by the scientific, technological and economic responsible departments, but others are run by scientific research units and factories and mines on their own. As a result, the initiative of both parties have been brought into play. Last year, the Chongqing Industrial Automation Instrument Institute and the Chongqing Instrument Materials Institute held a technology achievements trade fair on their own, and signed 19 letters of intent and 8 contracts. At the Sino-U.S. joint symposium on transferring technology to production that was held in the U.S. last October, the Chongqing Industrial Automation Instrument Institute briefed the participants on the technology market that the two institutes had held and roused great interest among American business circles.

In opening up a technology market, we have linked the economic interests of our scientific research units with those of our production units and thus given rise to a thriving situation whereby our scientific units take the initiative both to start research projects in the light of the needs of our production and to transfer science and technology to production units. According to the statistics on the seven scientific research institutes in which the technology contract system has been implemented, last year, these institutes undertook 154 research projects, a 3-fold increase compared to 1983 when the reform had not yet begun, and earned a net income of over 3.6 million yuan, a sum that was 27.5 percent bigger than the annual funds allocated by the state. They have also set up 30 joint scientific research and production associations with production units. In these associations, those who want a project researched provide the funds, and those who purchase the results pay the expenses. This has facilitated the socialization of scientific and technological work and the commercialization of technological achievements. As planned channels are combined with market channels in the work of transferring technological achievements, the rate of application of Chongqing's technological achievements has exceeded 81 percent, setting a new record.

Since the beginning of the opening of technological markets and the transfer of technological achievements, a large number of scientific and technical workers have correspondingly gone to production units to apply technology to production. This has been a rational movement of intellectual resources. In addition, 265 large and medium-sized enterprises and institutions in Chongqing have set up technological cooperation groups among their staff and workers in order to transfer technology, tackle technological problems and provide technological service.

/12913

CSO: 4008/2078

NATIONAL DEVELOPMENTS

ANHUI'S S&T SUCCESSES DURING 6TH 5-YEAR PLAN REPORTED

Hefei ANHUI RIBAO in Chinese 25 Dec 85 p 1

[Article by Tang Shengru [0781 4141 1172]: "Numerous S&T Successes in Anhui During Sixth 5-Year Plan Resulting in 1,800 Accomplishments and 1 Billion Yuan in Extra Profit"]

[Text] During the Sixth 5-Year Plan, the technical personnel in Anhui faced economic construction in courageous exploration to overcome difficulties and achieved significant accomplishments.

During the period, Anhui had close to 1,800 S&T accomplishments which is 1.5 times of that in the fifth 5-Year Plan. In 1985, 653 projects were completed which is 2.4 times that in 1981. Many accomplishments are at an advanced level in China and some may even reach the world standard. Based on statistics, among S&T accomplishments achieved in 1981 through 1983, more than 200 items received Chinese national invention awards or S&T accomplishment awards at the provincial or ministerial level. In 1985, 14 items received the Chinese national S&T progress award. These are signs that scientific research standards in Anhui is improving.

Recently, every research institution is more aware of the fact that we must face economic construction, and is more closely linked to economic construction. Various types of joint ventures between scientific research and production are vigorously developing. Under the premise that Government assigned projects are guaranteed to be completed, the majority of research institutions, to the extent possible, is adding lateral topics and self-chosen subjects to serve small and medium township and town enterprises. Based on bidding requirements stated by an industry, Anhui Institute of Optoelectronics spent merely 1 year and 2 months to finish the development of the Model CHY-B rubber sheet thickness gauge. After being tried out by Anhui Rubber Tire Plant, it was found to be able to conserve 10,000 kg of rubber per year. If a feedback control is added, then the amount of material cost saved can reach more than 1 million yuan. In the meantime, because of improved quality and reduced weight of tires manufactured, the social benefit created is more substantial. Various types of entities combining scientific research and production began to emerge in the Sixth 5-Year Plan. There are 436 such entities resulting in significant economic gains. Hefei has 40 combined entities which completed over 200 high standard projects and generated an additional income of approximately 200 million yuan for the city.

During the Sixth 5-Year Plan, in order to open channels for technical accomplishments to go into production, various scientific commissions and scientific associations held nearly 400 technology trade shows. Nine permanent technical markets have been established. There are more than 240 technical consulting and service organizations. The transfer and application of technical accomplishments is accelerated in order to produce a huge economic benefit. Based on incomplete statistics over the period 1981 through 1985, S&T generated 1 billion yuan in economic gains.

12553/9435
CSO: 4008/2051

NATIONAL DEVELOPMENTS

HEBEI'S RESEARCH INSTITUTES SCORED 'PLEASING' RESULTS IN 1985

Shijiazhuang HEBEI RIBAO in Chinese 13 Feb 86 p 4

[Text] In 1985, the provincial Academy of Sciences scored its best results ever.

In 1985, the Academy undertook a total of 131 research projects, an increase of 52 percent over 1984, and finished 47 projects which have passed acceptance checks, an increase of 36 percent over 1984. Among the 47 projects, 15 were of national advanced levels. The Academy has created 30 million yuan of economic results directly for the society, an increase of 110 percent and earned 1.41 million yuan of income in all. It has thus set new records in terms of number and level of projects and in terms of economic results.

The Academy's scientific research work has the following three major characteristics: 1) The number of "short-term, level, and speedy" projects needed for Hebei's economic construction increased compared with any year in the past. Of the 131 research projects, 80 percent are projects related to the development of new technology or products, and 63 percent are planned to be completed within 2 years. The number of the projects started and finished in the year was 13, an increase of 120 percent compared with 1984. 2) The level of the projects was further raised. Last year, the Academy undertook seven state-level research projects, four projects involving major hurdles for the province, and more projects that had a greater influence than in 1984. The project carried out the [Hebei] Institute of Microbiology on enzyme boxes of glucose oxidase has been included in the list of the state's first-grade "spark plan" projects. The joint project between the [Hebei] Institute of Geography and the Institute of Environment Chemistry of the Chinese Academy of Sciences entitled "Prevention of and Policy to Counter Water Pollution in the Beijing-Tianjin Area" is a key state project to be tackled. The Energy Institute's portable tourist sun-energy stove is not only advanced nationally, but has also entered the international market. 3) It has continued to popularize its existing research achievements which originally yielded high economic results. At the same time, it has carried out a number of software scientific research projects which have played an important role in production service. For example, the Mathematics Institute successfully developed software for Xingtai Pharmaceutical Factory to control its production of terramycin chloride. As a result, the factory switched from suffering a per ton loss of over 10,000 yuan to earning a per ton profit of 3,000 yuan, enabling the factory to turn its losses into profits.

NATIONAL DEVELOPMENTS

HEBEI'S SUCCESS IN USING S&T TO AID POOR REPORTED

Shijiazhuang HEBEI RIBAO in Chinese 28 Dec 85 p 1

[Text] In recent years, all S&T management departments in Hebei has been emphasizing the use of science and technology to aid the poor. Several measures have been taken to provide services in technology, talent and information. Significant results have been obtained in helping people prosper by developing local resources.

Provide a series of matching applicable advanced technology for regional development. Since 1982, the Scientific Commission of Hebei organized large scale efforts to comprehensively develop S&T in regions such as Taixingshan, Yanshan, Bashang and Helonggang. In Taixingshan, based on local resources, we chose to initially start from fruit and livestock and poultry and then to continue to other levels of rural business. We dedicated our effort to the development of production techniques in high level processing of agricultural products and by-products, comprehensive utilization of resources, storage for freshness, and mining. Based on statistics, there are 37,550,000 fruit trees already under scientific control. Over 18,540,000 head of livestock and poultry have been raised. More than 20,000 processing points were established. Over 60 model S&T industries were built. More than 20 technical accomplishments resulted from a series of complete technology. It was expanded to more than two-thirds of the villages in Taixingshan. The development work in Helonggang consisted of over 20 topics including farming on dry fields, fruits, livestock and processing. The work resulted in the promotion and application of 36 sets of applicable technology. Progress was also made in the development of dry fruits in Yanshan as well as flax, potatoes and livestock in Bashang.

Widely organize technical personnel to teach technology and train people. In recent years, more than 5,000 technical personnel from over 100 research institutions and universities participated the S&T effort. Various levels of technical management departments also retained over 3,000 technical people from Hebei, Beijing, Tianjin and other regions to offer technical consultation and to form service teams to teach technology and train people. Based on statistics, several thousand practical technical items were taught and over 1,000 new products were developed. More than 8,000 sessions of training were offered at various levels on different subjects. More than 120,000,000 people attended those sessions. Over 200 S&T model villages were built and 50,000 S&T model families were trained.

Open the technical market and spread S&T economic information. Since October 1984, information wagons of Hebei Institute of S&T Information have been covering remote areas in the field. They entertained over 200,000 poor people, spread 10,000 pieces of information, held over 30 lectures, and showed S&T videos for more than 200 times. In order to further aid poor areas to change their images, the institute recently established a long term cooperation relation with three counties including Fengning to provide applicable advanced technology.

12553/9435

CSO: 4008/2051

NATIONAL DEVELOPMENTS

HUNAN SUCCESSFULLY POPULARIZES S&T ACHIEVEMENTS

Tianjin JISHU SHICHANG BAO in Chinese 18 Feb 86 p 1

[Article: "Hunan Successfully Popularizes Achievements of Scientific Research Science and Technology"]

[Text] During the Sixth Five-Year Plan, Hunan Province scored marked achievements in popularizing achievements of scientific research and science and technology. According to the statistics, Hunan Province reported to higher authorities over 4,000 achievements of science and technology, among which over 2,000 were relatively important. It won 27 State Invention Awards, 3 State Natural Science Awards, 46 State Scientific and Technological Progress Awards, and granted 685 provincial outstanding Scientific and Technological Achievement Awards. The percentage of scientific and technological achievements that were to various extents applied to and popularized in production rose from 28 percent in 1979 to 52 in 1984. Very marked economic results were achieved after the popularization of the achievements. Since 1983, the province has popularized about 2,000 new achievements, and developed more than 1,490 new products, of which 1.058 billion yuan of economic results have been taken into our statistics.

The number of Hunan's technological trade service organizations of various kinds have risen to 234. This has enabled Hunan to shorten the average period of the popularization of scientific and technological achievements from 2 years and 3 months at the initial period of the Sixth Five-Year Plan to 1 year and 4 months. It took only a few months to popularize some of the achievements.

/12913

CSO: 4008/2079

NATIONAL DEVELOPMENTS

JIANGSU'S 'IMPRESSIVE' S&T ACHIEVEMENTS DETAILED

Tianjin JISHU SHICHANG BAO in Chinese 18 Feb 86 p 1

[Text] During the Sixth Five-Year Plan, Jiangsu achieved numerous scientific and technological results with high economic results and of an advanced level. According to recent statistics prepared by the provincial Science and Technology Committee, the various areas and departments in the province reported and registered 9,507 scientific and technological achievements, of which 5 percent approached or reached international advanced levels, 22 percent were new domestically, and about 50 percent were of advanced level's domestically. Among these achievements, 123 were granted State Invention Awards and Scientific and Technological Progress Awards, and 1,702 were granted awards by the Jiangsu Provincial People's government. Among the applied technological achievements, 85 percent have already gained relatively satisfactory economic results. From 1981-1984, Jiangsu Province developed 806 new products, and established 60 factories, 228 workshops, and 213 production lines. A calculation of the economic results that have already emerged and that can be estimated, reveals that the above new factories, workshops and lines can yield an increase of 1.4 billion yuan in output value, increase the tax payments and profits by 350 million yuan, and earn US\$15.46 million of foreign exchange. According to statistics, the 405 projects that have been popularized throughout the province can increase the output value by 940 million yuan.

/12913

CSO: 4008/2079

NATIONAL DEVELOPMENTS

TECHNICAL ADVANCES IN JIANGSU LOCAL ECONOMY REPORTED

Beijing REMIN RIBAO in Chinese 18 Jan 86 p 3

[Text] Since 1895, technical personnel in Jiangsu have dedicated their energy to technical developments required in economic construction in order to find new ways to vitalize the local economy and create new experience.

Develop a series of technology to create and develop superiority for local business. Many cities and counties were aiming at developing superiority for industries with local characteristics. Effort was concentrated to develop a series of related technologies, from choosing topics to creating production capabilities. Not only are accomplishments achieved but also products are manufactured and profits are made. The textile system in Jiangsu organized its effort to tackle 471 projects to digest and absorb complete systems based on imported technology and equipment. To date, 300 programs have been completed. Some equipment has already been placed in production to promote technical advances of the entire trade. Silk industry is developed around Suzhou. A series of technical developments from improving the silk producing rate of silkworms, developing new species, renew equipment, to processing after printing and dyeing has been worked on to resolve many technical problems and to advance silk technology. In 1985, the amount of silk exported from Suzhou increased by 13 percent as compared to that for a year before. The export created more than 100 million dollars in foreign exchange.

Comprehensive utilization of favorable resources to adjust the rural industrial structure. In order to meet the urgent demand to specialize, commercialize and modernize the rural economy, many cities and counties began to make changes toward these goals from developing science and technology related to agriculture. They shifted from primarily producing grain, cotton and vegetable oil toward various side businesses in agriculture, forestry, animal husbandry and fishing; from producing basic products to planting, feeding, and processing; and from raising quantity to improving quality, profit and ecological benefit. Projects were planned by focusing on the development and processing of "famous" agricultural products and by-products and comprehensive utilization of ocean, fresh water and mountain area resources in order to convert advantages in resources and technology into products.

Select applicable advanced technology to test, demonstrate and promote to serve small and medium enterprises and township and town enterprises. Many cities and counties used the strategy to "expose the focal points in order to initiate a chain reaction." Limited capital and technical force are concentrated to cover items which will have an overall impact on the total situation. A base for testing, demonstration, training and promotion is created to move technology forward. The comprehensive mountain area development at Fujiachun in Lishui county promoted all kinds of trades in agriculture, forestry, fishing and other part time work. It explored new ways to develop hilly areas in Jiangsu which accounts for 14 percent of the total area in the province. The breakthrough in high quality aquatic products in open water will move fresh water breeding to the open, resulting in the comprehensive and three-dimensional development of 26 million mu of water resources in Jiangsu. During the process of serving small town businesses, many departments created various new experiences. Some provided door to door services to deliver information, data, samples and technology and others provide complete technical services from market survey to product development. Some hold routine news release meetings and others serve as a bridge to continuously lead technology into small businesses.

12553/9435
CSO: 4008/2051

NATIONAL DEVELOPMENTS

TECHNICAL INVESTMENT IN JIANGSU REPORTED

Beijing REMIN RIBAO in Chinese 18 Jan 86 p 3

[Unattributed article: "Experience in the Sixth 5-Year Plan Shows S&T Investment Is Paying off; Every Yuan Invested Results in 28 Yuan of Products and 7 Yuan in Royalty"]

[Text] According to recent statistics released by the Scientific Commission of Jiangsu, a large number of high level, good return technical accomplishments were achieved in the Sixth 5-Year Plan period. Between 1980 and 1984, there were 9,507 technical accomplishments reported. There was one outstanding award, 10 first class awards, 28 second class awards, and 68 third class awards. The provincial government of Jiangsu issued citations to 1,702 items.

The Scientific Commission of Jiangsu performed a statistical analysis on the situation and economic benefits of technical programs carried out in the Sixth 5-Year Plan period. Progress was made in science and technology in that period through the implementation of technical projects. Significant socioeconomic benefits had been obtained. From 1981 to 1984, Jiangsu completed 2,052 technical projects. The completion of these programs resulted in 806 new products, 60 plants, 228 workshops and 213 production lines. Based on calculable economic benefits for items already in production, annual productivity and royalties can be increased by 1.4 billion and 350 million yuan, respectively, corresponding to 28 and 7 times the initial investment. One yuan of investment can generate 28 yuan of products and 7 yuan worth of royalties. In addition, these items earned a total of \$15.46 million dollars in foreign currency. Most of these items are being applied.

Based on statistics on 405 items already promoted, the annual increase in productivity reached 940 million yuan. Total increase in productivity due to completion and promotion of technical projects in Jiangsu could reach 2.34 billion yuan per year, which is 2.3 percent of the 1984 GVLAO. It corresponds to 13 percent of the total increase in industrial and agricultural productivity between 1983 and 1984.

12553/9435

CSO: 4008/2051

NATIONAL DEVELOPMENTS

SHANXI'S S&T CONTINGENT DEVELOPMENT REPORTED

Taiyuan SHANXI RIBAO in Chinese 19 Dec 85 p 1

[Article by Liu Changhai [0491 7022 3189] and Ren Yuanming [0117 2494 6678]:
"S&T Contingent Rapidly Developed during 6th 5-Year Plan in Shanxi"]

[Text] During the Sixth 5-Year Plan, the S&T contingent in Shanxi developed very rapidly. To date, there are 224,265 technical personnel in natural science; corresponding to an increase of 46.8 percent as compared to that in 1980. There are 102,652 engineers, 13,345 agricultural technicians, 44,947 teachers, 57,889 medical technicians and 5,432 researchers. A contingent with socialist awareness and modern technology knowhow has already been formed.

In this team, there are 1,154 senior technical personnel and 31,616 middle level technical personnel. Based on a survey, 20 percent of the junior personnel are working in the capacity of middle to senior level positions with outstanding accomplishments.

In recent years, under the support of the Communist Party and the Government and with the assistance from the people, technical personnel in Shanxi were organized to overcome difficulties. During the Sixth 5-Year Plan, Shanxi won 22 national invention awards and 15 national S&T progress awards. They received nearly 700 S&T accomplishment awards from the Government of Shanxi. There were 47 first class awards, 123 second class awards, 273 third class awards and 240 fourth class awards. These accomplishments have been applied to production and obtained significant socioeconomic benefits.

12553/9435
CSO: 4008/2051

NATIONAL DEVELOPMENTS

NINGXIA SCIENCE, TECHNOLOGY ORGANIZATIONS DISCUSSED

Yinchuan NINGXIA RIBAO in Chinese 16 Nov 85 p 1

[Article by Liu Changming [0491 2490 2494]: "Numerous Scientific and Technical Personnel and Staff and Workers Painstakingly Obtain Many Scientific Research Achievements"]

[Text] Since the 3d Plenary Session of the 11th Central Committee, major developments have taken place in our region's science and technology, reaping many scientific achievements, significantly raising the level of economic benefit and social benefit, and playing an important role in the region's economic construction.

Currently there are a total of 57 scientific research agencies in the entire region, 40 of them being independent scientific research agencies with more than 1700 scientific and technological personnel. Compared with the situation before the 3d Plenary Session of the 11th CPC Central Committee, the number of scientific and technological personnel has more than doubled.

Working hard for the prosperity of the country, the broad masses of scientific and technical personnel as well as staff and workers have worked assiduously in tackling major problems, repeatedly making scientific and technological achievements.

Until now, those topics receiving the award of Autonomous Region First Class Achievement alone number over 600, of which 300 topics have earned the Science and Technology Achievement Award and the Progress in Science and Technology Award promulgated by the People's Government of the Autonomous Region. Nearly 30 scientific and technological topics in the region have received awards from various departments of the State Council, and most recently another three topics earned the national level Progress in Science and Technology Award. Among these scientific and technological achievements, over 20 are inventions, and two received patents in the most recent announcement by the Chinese Patent Bureau, receiving in addition the First National Invention Exhibition award.

These achievements in science and technology have shown that the level of our region's scientific and technological work has risen greatly in terms of being advanced, practical, and economical. In the region there are over 40 scientific and technological achievements which have reached the advanced

level nationally, some of them filling in blanks within the nation. Over 80 percent of the achievements in science and technology have been employed, and popularized, and have brought into play an important effect in the vitalizing of our region's economy. Based on the 1984 statistics on the 46 scientific and technological achievements applied directly to production, their economic benefits reached more than 100,000,000 yuan, 15 of them reaching over 1,000,000 yuan. The successful development of and manufacture by the Ningxia Chemical Research Laboratory of a buffing wheel used for the fluorescent screen interface of a color picture tube, and the placing of it into production to provide parts for Chinese-made television sets, saving a large amount of foreign exchange. The research and application by the Ningxia Nonferrous Metals Research Laboratory of niobium oxide porcelain articles not only increased production of niobium oxide of a high degree of purity but also greatly reduced electrical consumption and contamination by nonmetallic foreign matter, effectively eliminating fluoride. By successfully replacing platinum crucibles with niobium oxide porcelain ones the Ningxia Nonferrous Metals Research Laboratory saved as much as 1,000,000 yuan in funding. The antistatic plastic tubes developed successfully by the Ningxia Light Industry Design Research Laboratory are safe and reliable, can replace metallic tubes used under wells, and fill a gap for our country. The agricultural and forestry research units concerned, the technical institutes and universities, and agricultural technology extension departments in our region put forth a cooperative effort, actively spreading large-area rice cultivation technology, causing average rice production per mu to exceed 1,000 jin. The Ningxia Livestock Veterinarian Research Laboratory achieved success while carrying out intermediate experiments in the production technique of cow circular piroplasmosis cultured cell vaccine, producing the first Chinese antiparasite disease vaccine, the use of which has spread widely in epidemic areas in North China with significant results.

8174

CSO: 4008/2041

NATIONAL DEVELOPMENTS

THEORETICAL MODEL FOR S&T REFORM DISCUSSED

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENCE OF SCIENCE AND MANAGEMENT OF S&T] in Chinese No. 2, 1986 pp 15-16

[Article by Hu Shilu [5170 0013 4389], Sichuan Institute for the Study of Science: "Problems Regarding the Theoretical Model for Restructuring the Science and Technology System"]

[Text] Models simulate and describe the true shape of things. The so called theoretical models, also called logical models, through a high degree of abstraction theoretically outline an explanation that has similarities to the forms and structures of things. Restructuring the science and technology structures is a system by which science and technology [S&T] arranges forms of management, the installation of management structures, and the delineation of management authority. What we have called the restructuring of the science and technology system is where we have wanted to restructure and transform structures that are inappropriate to or that impede the development of science and technology, where we have established new structures that can adapt to or promote the development of science and technology. The theoretical model for this restructuring of the science and technology model includes work in these two aspects: one is to produce a theoretical outline of the former science and technology system; the other is to produce a theoretical outline of how we ought to change and what new system for science and technology we should establish.

What is the theoretical model for our former science and technology system? In summary, there are chiefly four points: first, the self-created science research system composed of the so called "Five Front Armies" throughout the entire country, these are the Chinese Academy of Sciences, higher institutions, production departments, the national defense system, and local science research structures. Second, these "front armies" are for the most part highly concentrated under national or local administrative departments, carrying out planning and management according to a vertical model. Third, science research academies and institutes are under a unitary system of ownership by the people. Fourth, they are largely institutions where research expenses are guaranteed by the state and where scientific and technical achievements are transferred to the applying unit without compensation. The defects in this sort of system are chiefly also in four areas: 1. the research system is self-contained, and having broken relations with the economic

system, scientific and technical achievements lack structures through which they are automatically transformed into production, and the economic results are low; 2. lateral relations within scientific research are fragmented, and there is serious dispersion, repetition, and waste; 3. the state has been too protective of research units and govern them too tightly, so that scientific and technical units lack their rightful autonomy, which has repressed initiative and creativity in scientific and technical units; 4. we have neglected the commercial nature of scientific and technical achievements, and we have not been able to recover materially from scientific and technical achievements. These things have all been apparent in a loss of vitality to a great degree in our former science and technology system. This is both unsuited to the requirements of economic development and cannot adapt to the needs of the development of science and technology themselves; this is not only not helpful to the reliance on science and technology in economic construction, but is also not helpful to science and technology as it caters to economic construction.

The new science and technology system that we are to establish should be a system that is helpful to advances in science and technology. Because of this, in light of the defects in our former science and technology system, the fundamental direction for this restructuring should be to powerfully enhance the close integration of science and technology with production, to allow scientific and technical achievements to be rapidly and broadly used in production, to give full play to the decisive function of science and technology in building the national economy, and to promote economic and social development. According to this fundamental direction, the theoretical model for the current restructuring can be summarized and described in the following four sentences: use the energy from a strengthened science and technology system to be the central link in restructuring; make restructuring of the allocation system the starting point; treat acceleration of the commercialization of technical achievements and the opening up of technology markets as targets of restructuring; make the focus of the restructuring the solution of the three problems of expansion of the autonomy of science and technology units, increasing the function of economic levers in the science and technology management system, and enhancing the lateral relations within science and technology.

This energy used to strengthen the science and technology system is what will allow our science and technology system to have an organic life, where its internal cells, organization, and organs are all living, and by which the entire organism can continuously generate things, capabilities, and information exchange, and can undergo a process of metabolism. The energy in the science and technology system should be particularly manifest as beneficial to the improvement of four abilities for this system: to be beneficial in improving the creative capacity of science and technology units, to be beneficial in improving the capacity to transform scientific and technical achievements into production, to be beneficial in improving the capacity to radiate out from regions, and to be beneficial in improving the capacity for absorption of advanced scientific and technical achievements both foreign and domestic.

What we mean by considering the restructuring of the allocation system as the starting point of restructuring is just changing that method from the past in which all research expenses were basically guaranteed by the state to one in which funds are managed categorically according to the characteristics of different scientific and technical activities. Based on the characteristics of different scientific and technical activities in this country, funds management from now on will primarily be in the four forms of a contract system, a fund system, a responsibility system, and a "risk system": that portion of applications research in technology development and from which one can expect results of practical value, a technology contract system will gradually be practiced; for basic research and a portion of applications research, we will progressively try out a science funding system; for those research structures engaging in public service work and that are in the service of science and technology, the state will still allocate expenses and there will be a funds responsibility system; for major research projects where the risk is great, the state should establish a "risk investment fund" and implement a "risk system."

In changing the allocation system, in addition to implementing categorical management of expenses this will also include science and technology allocation from central and local finances, and the rate of growth of expenses for all scientific and technical activities ought, within a short time from now, to be higher than the economic rate of growth of everyday financial revenue or of the gross output value of national production. The flexibility coefficient of science research funds is equal to the rate of growth of science research funds divided by the rate of economic growth. To guarantee that scientific and technical progress will be at the forefront of the building of production, the flexibility coefficient of science research funds should be greater than one, that is, the rate of growth for science research funds should be greater than the rate of growth for the economy. Looking at the situation in Sichuan, in the 10 year period from 1971 through 1981, the average annual rate of growth for science research funds was 4 percent while the average annual rate of growth in the industrial-agricultural output value was 6.9 percent. The flexibility coefficient for science research funds during this period was 0.58 percent, much less than 1. This is a partial reflection that our growth in science research funds is too slow and is not helpful to scientific and technical progress and to science and technology being at the forefront of building production.

What we mean by the commercialization of scientific and technical achievements is that in the process of their circulation and according to the commercial nature of technical achievements, that they consciously rely on and use the laws of value to regulate the relations of exchange and allocation between the inventors and creators of technical achievements. The commercialization of technical achievements can be done through many forms and channels. As, for example, through implementation of a compensated contract system for technology, a technology patent system, and a bidding system.

What we mean by expansion of the autonomy of scientific and technical units is to allow scientific and technical units to become living cells in the entire science and technology organism, and to become relatively independent research entities. Aside from a few research units that must still be directly

subordinate to the leadership of government departments, most should not be subordinate to government departments so that they can face up to the needs of society, the economy, and science and technology developing work on their own. Seeing that scientific and technical labor is a creative complex labor, with greater flexibility than material production, in certain senses research institutes should have more autonomy than do enterprises. When research institutes carry out the institute director responsibility system, the institute director should have the following authority in the institute: in the area of planning, with the prerequisite of guaranteeing completion of tasking in national planning, they would have the authority to select and determine research topics, to take on tasking in all aspects of society, and to disseminate and transfer the rights to research achievements; in the area of scholastic work, and according to the needs of research and the branch of learning, they would have the authority to expand scholastic exchanges and cooperation both domestic and foreign; in the matters of personnel, and in accordance with the requirements of research and set personnel formulations, they would have the authority to determine internal organizational structures, and according to organization procedures, to hire and fire or recommend the hiring or firing of cadre, give notice of vacancies, dismiss personnel, check proficiency, and reward and punish working personnel; in matters of finance, in accordance with national policy resolutions, they would have the authority to arrange for operating expenses and to allocate themselves income created outside of planning. After carrying out the separation of government and research and expansion of autonomy for scientific and technical units, government departments in charge of science and technology will primarily use administrative, economic, and legal means to formulate overall science and technology developmental planning, major science and technology policy, and science and technology laws and regulations. They will also work out directions of a guidance nature for scientific and technical development, organize problem solving for major projects, hire and fire and manage cadre within set limits, and organize international science and technology exchanges and cooperation. Work, this way, is not only beneficial to invigoration on the lower levels, but is also of value for overall control.

What we mean by increasing the function of economic levers in the management system is that we should change the old way of doing things that only used administrative means to manage science and technology, and to add some economic means of management. Aside from changing the allocation system and opening up the technology markets, the nature of these economic means will also be apparent in some science and technology work, especially in technical development and a portion of applications research. Funding and selection of topics will consider technical and economic analyses, research will undergo economic accounting, evaluation and transfer of the rights to achievements will take economic results into consideration, and allocation relations within the institute will be characterized by more pay for more work and rewards for effort and punishment for sloth. In the planning and management system for science and technology, it should be like the economic planning system, which is divided into directive planning, guidance planning, and market regulation, and also should progressively decrease topics in directive planning, increasing projects in guidance planning and market regulation. When directive planning is undertaken, that is primarily for major scientific and technical tasking concerned with the national economy and the people's

livelihood, as well as major topics strongly exploratory or high in risk; for a great number of research topics, national departments that manage science and technology will periodically issue "guides to the development of science and technology" based upon the needs of social, economic, and science and technology development to guide the development of science and technology macroscopically; the majority of science and technology development work will be regulated primarily through the technology markets.

What we mean by strengthening lateral relations has two senses: it includes both the strengthening of internal lateral relations, as well as strengthening the lateral relations between science and technology and production. Only in this way can we conform to the trends in the integral development of science and technology and to the trends toward increasingly closer integration of science and technology with production. The primary measures for strengthening lateral relations within science and technology are changing the situation in which science and technology is internally fragmented by "front armies"; centering on "wings" organized from many disciplines for integrated tackling of key problems for comprehensive topics; enhancing the close integration of the natural sciences and social sciences, where their planning and management ought to be centralized under national departments in charge of science and technology, and it may even be considered, when the conditions are ripe, that besides putting social science that is purely ideological into propaganda departments, that the existing Chinese Academy of Sciences and the Chinese Academy of Social Sciences could be combined into a unified Chinese Academy of Sciences; for demonstration of major scientific and technical projects, we will not only arrange for the participation of relevant disciplines from the natural sciences, but will also arrange for the participation of relevant disciplines from the social sciences; we will pay close attention to developing comprehensive, overlapping, and intersecting emerging new disciplines, etc. Primary measures to enhance lateral relations between science and technology and production include: encouraging all scientific and technical structures to establish all sorts of cooperation with enterprises and design organizations on the basis of voluntary participation and mutual benefit, some of which could develop into economic entities; some could merge on the basis of that joining, or enterprises could become part of research organizations, or research organizations could become part of enterprises, and some research organizations could develop on their own into research and production type enterprises.

12586

CSO: 4008/2088

NATIONAL DEVELOPMENTS

ENTERPRISES' LACK OF ENTHUSIASM FOR TECHNOLOGY PURCHASES VIEWED

Tianjin JISHU SHICHANG BAO in Chinese 18 Feb 86 pp 1,2

[Article by Ge Yuehua [5514 1878 5478] and Li Yuming [2621 3768 2494]: "Why are some industrial enterprises not enthusiastic about purchasing new technology"]

[Text] Editor's note: Industrial enterprises are sellers as well as buyers of new technology. In order to make our technology prosperous, we must rouse our industrial enterprises' enthusiasm. The article by Ge Yuehua and Li Yuming raises some important problems related to the development of our technology market. This paper welcomes discussion in this area and hopes that more comrades will enthusiastically contribute their articles on this matter to our newspaper.

At present, there is a prominent problem in the development of our technology market, namely, some industrial enterprises lack interest in the purchase of new technology or the development of new products. As a result, in the technological market in some areas, many technological achievements are waiting for buyers. This has already become a barrier to the deepening of the development of our technology market. If our enterprises' enthusiasm is not roused, it is hard for our technology market to prosper.

Recently, we have made an investigation about this matter and found that there are relatively many factors that affect the enthusiasm of our enterprises. In the main, there are the following three factors: enterprise leaders' lack of understanding of the significance of technology; failure to formulate necessary policies; and the problems related to our scientific research achievements.

Enterprise Leader's Lack of Understanding

To a very great extent, an enterprise lacks enthusiasm about the adoption of technology and development of new products because of the understanding of its leaders. This can be summed up as follows:

-- The idea of turning technological achievements into commodities has not really been fostered in the minds of enterprise leaders. The leaders of some enterprises are still accustomed to getting transference of technology free of

charge and think that spending money to purchase technology is "foolish" and "does not pay."

-- They regard adoption of new technology and development of new products as "expedient measures." Some enterprises consider the adoption of new technology only when their products are unmarketable and they are thus having difficulties. If they can tide over their difficulties, they will stop considering the issue of improving their product technology and substituting a new generation of products for old ones.

-- They lack the strategic idea of long-term development and are satisfied with maintaining the status quo. The leaders of some enterprises are near retirement; therefore, they lack the enthusiasm needed to continue to chart out paths for their undertakings, dare not take risks and are satisfied as long while they are in office the wages, benefits and bonuses for their staff and workers do not decline. Thus, they do not consider the long-term interests of their enterprises.

-- They consider their enterprises to be the best and are blindly complacent. The leaders of some enterprises think that their enterprises have many technological personnel and strong technological forces and that their products are in great demand in the society and enjoy a relatively great market share; therefore, they consider their enterprises to be the best and look down upon the achievements on sale in the technology market. As a result, they develop technology only by relying on the technological forces of their own enterprises and do not utilize the strength of the society.

Failure to formulate necessary policies

-- Many aspects of the current policies are detrimental to rousing enterprises' enthusiasm in pursuing technological progress.

There is a shortage of technology development funds. This is a problem common to most enterprises at present. Many enterprises lack the funds needed for the purchase of new technology. Even if they have developed new products, they lack the funds to renew their equipment and thus cannot acquire the production capacity to produce the products. They have reflected the fact that their rate of retained profit is still very low. After deduction of a 55 percent income tax, and in addition, product tax, business tax, ad valorem tax, readjustment tax, energy and communications tax and so on, there is little left of the profits they worked hard the year round to earn. A portion of the small retained profits has to be transferred to their production, bonus, and benefit funds and used for the apportioned expenses of society; therefore, they do not have much capacity to develop new products or purchase new technology. For example, last year, Tianjin's First Bureau of Light Industry earned 450 billion yuan of profits, but delivered 330 million yuan of it to higher authorities. As a result, the per capita retained profit for many factories under the Bureau was less than 200 yuan, barely enough for maintaining simple reproduction. Some factories each only had several thousand yuan of development funds a year, too small an amount for doing anything major.

-- Taxation issue. At present, the scope of tax exemption for our new products is relatively narrow. Last year, the enterprises in Tianjin applied for tax exemptions amounting to over 100 million yuan, but owing to financial consideration, a little more than 8 million yuan in exemptions was finally approved. This to some extent dampened the enthusiasm of our enterprises in developing new products and applying new technology.

-- There are problems related to the price of new products. When the prices are reasonable, after developing a new product the enterprise will be compensated for the production costs and circulation expenses. Then it will be willing to continue to develop new products. But at present, the differences in prices between new and old products and between products of fine and poor quality have not yet been widened. Some enterprises have been producing the same products for dozens of years, but they are still able to earn a pretty good profit, but others have suffered a reduction in their profits because they have incurred more expense in applying new technology and developing new products. For example, the Tianjin Automobile Industrial Company did research on the manufacture of an "efflux combustion chamber" for automobile engines, which was an advanced product that conserved energy. However, the company failed to put it into production, because the strict technological production process and the increase in costs prevented the prices of the motor engines from being changed. The enterprise received no benefits and lacked enthusiasm in producing the products.

-- The problem of assessing the technological progress of our enterprises. At present, the leading departments of our enterprises mainly assess the performance of our enterprises by their fulfillment of output value and profit targets. This causes our enterprises to be concerned with fulfilling their short-term tasks and does not enable them to spare any resource for the development of new technology and products. For example, the Tianjin Bicycle Factory has been burdened with the heavy task of operating in excess of its production capacity. It dare not spend much time in researching new technology. There are no clear requirements on the factory concerning the application of new technology, the development of new products, the number of new products that have replaced the old ones, or plans and measures related to technological progress. Therefore, the enterprises focus only on the fulfillment of the targets related to output value and profit and do not make efforts toward technological progress.

Problems related to our scientific research achievements themselves

Another important factor that affects the enthusiasm of our enterprises in purchasing new technology and achievements is whether our scientific research units can proceed from the actual needs of our production and develop the achievements that meet market demand.

For a long time, because our scientific research units have been assigned tasks by higher authorities and allocated funds by the state, they seldom have shown concern about our production and economic construction and know little about production reality. Thus, their research achievements are divorced from production requirements, and they are either inapplicable or too expensive for our enterprises. For example, a certain research institute in Tianjin has

carried out quite a few advanced projects, but few of them have been applied in our production. A certain glass factory in Tianjin has relatively backward technology and wants to use the institution's achievements, but none of them meet its demand.

-- The achievements themselves are not perfect. Because some research units lack the necessary testing and measuring facilities, their research achievements are merely "semifinished products" and are still quite a long way away from batch production. Our enterprises do not know the degree of reliability of the achievements and have to exert great effort to continue to perfect the achievements; therefore, they are not willing to purchase technology in our technology market.

-- The achievements are not complete. The application of a new research achievements often requires the solutions to some relevant technological problems. Only when all these problems are solved can this achievement be complete and be able to be put into operation. Our scientific research units often fail to do so. As a result, without the solution of supplementary problems, the enterprises find it difficult to use the achievements. These units are often unwilling to do the supplementary technological work for the technology that they have already sold and think the work troublesome. Therefore, our enterprises are unwilling to purchase the achievements from the scientific research units.

How Can We Rouse the Enthusiasm of our Enterprises

We think that the fundamental reason for our enterprises' lack of enthusiasm in purchasing new technology and developing new products lies in our economic system. Turning technology into commodities is a breakthrough in the restructuring of our scientific and technological system, yet its basis is still the restructuring of the economic system. Because at present we entirely fail to keep the restructuring of our economic system in line with the restructuring of our scientific and technological system, it is still impossible for our enterprises to have a free hand in participating in technological trade activities. At present, our economic structural reform is underway, but it takes time to streamline our administration, decentralize power and enliven our enterprises. Under these circumstances, it is necessary to adopt some measures to give play to our enterprises' initiative in purchasing new technology and developing new products in order to promote their technological progress.

-- We should find diverse ways to raise technology development funds. One year ago, the Tianjin Municipality People's Government issued a document which clearly points out 10 ways to raise funds for developing new technology and products. These are the measures to ensure that our enterprises fully utilize the existing funds of various kinds. For some key development projects, such as the projects included in the plan at and above city-level, within the 3 years after they are put into production, we should allow our enterprises to retain a certain percentage of the newly added pre-tax profits as their technology development funds. We should clarify that a certain percentage of an enterprise's fixed assets depreciation funds should be spent in technological development. In regard to the projects that are carried out by

enterprises' own funds or by loans, we may consider allowing the enterprises to retain the basic depreciation funds of the fixed assets that have been newly put into operation for repayment of the loans and for technology development. We suggest that our banks provide loans at preferential interest rates for enterprises to develop science and technology. Priority should be given to supporting the projects with advanced technology and large economic results and social benefit. A separate account should be opened for the new product development funds as a part of the retained after-tax profits of our enterprises and be specially used for this very purpose. If the enterprises do not spend the funds for the time being, they can lend the funds to other enterprises through our banks to be spent in the new product development of other enterprises.

-- We should continue to support new products. On the basis of the implementation of the regulations related to tax exemption for new products, we should consider widening the range of exemption. At the same time, we should reduce the rate of readjustment tax for the enterprises that have made satisfactory technological progress and earned high profits in order to enable advanced enterprises to have more financial resources for their development of new products. For the enterprises who spend their own special funds in developing new products, after the new products are put into production, we should collect only the income tax but exempt readjustment tax for the enterprises, until the total amount of readjustment tax exempted equals the amount of investment. Every year, we should announce a list of products to be eliminated and set a deadline for the cessation of their production. If production is continued, we should impose a larger product tax in order to facilitate the elimination. If a new product outside of the plan is indeed of advanced level and is a real invention, we can give approval for treating it the same as a new product within the plan.

-- We should allow preferential prices for quality new products. We should conscientiously implement the government's policy on fixing prices according to product quality. An enterprise whose products are allowed a price premium because of the fine quality can keep all the income from the price premium. The prices of improved products should be different from the prices before improvement. An enterprise can apply for a price increase on a product for which it incurs more costs because it adopts new technology to improve the quality of the product.

-- We should clarify the substance of the assessment of the technological progress of an enterprise. The departments concerned should draw up assessment criteria and methods as soon as possible, which may include: whether an enterprise has drawn up a plan for its technological progress and for the upgrading and renewing of its products, the ratio of its annual spending in developing new products to its total production funds, the rate of product renewal, the rate of the output value of its new products, the number of products that reach domestic and international advanced levels, and the technological composition of an enterprise. In selecting advanced enterprises, we should regard technological progress as an important condition. We should give certain awards to the enterprise leaders who have comprehensively fulfilled the various targets for technological progress and the technological personnel, staff and workers who have made contributions to technological progress.

APPLIED SCIENCES

NEW ACCELERATOR TO BOOST NATION'S NUCLEAR PHYSICS RESEARCH

Beijing RENMIN RIBAO (OVERSEAS EDITION) in Chinese 11 May 86 p 1

[Text] Tandem Accelerator To Begin Operations

Beijing, 10 May (XINHUA SHE)—China's first large-scale tandem accelerator nuclear physics laboratory was recently completed at the China Atomic Energy Research Institute and will soon become operational. This is a modern, low-energy nuclear physics laboratory of advanced international standards whose completion signals China's entrance into a new era of nuclear physics research.

The laboratory, which carries a price tag of 50 million yuan, occupies an area of 8,300 square meters. Its tandem accelerator has a peak voltage of 13MeV and was imported from abroad, although most of the auxiliary equipment has been manufactured domestically. The tandem accelerator is one of today's most powerful instruments used in low-energy nuclear physics research. It permits the acceleration of particles of practically all of the elements in the Periodic Table to energy levels of from several tens to over 100 MeV. Using these high-energy accelerated "artillery shells" to bombard atomic nuclei transforms them, producing various light particle nuclear reactions and heavy ion nuclear reactions in order to study the laws governing the action of atomic nuclei. The energy level of this large-scale accelerator can be continuously adjusted and its energy resolving power is high, making it ideally suited for systematic, precise, and concentrated nuclear physics experimental research. It can be used in investigations of such phenomena as light particle nuclear reaction, heavy ion nuclear reaction, nuclear spin, heavy ion fusion, the creation of new elements and the application of nuclear new technologies.

An official of the China Atomic Energy Research Institute told this reporter that they sincerely welcome those working in the same field to make use of this large accelerator for the purpose of elevating China's nuclear physics research to new levels.

/9274

CSO: 4008/60

TRAINING SIMULATOR TECHNOLOGY USED IN CHINA'S ARMED FORCES

Beijing XIANDAIHUA [MODERNIZATION] in Chinese No 2, 1986 p 18

[Article by Xiao Hao [1420 4110]

[Text] Along with the rapid development of electronics, microelectronics, and electro-optic technologies in the 1970's, the developed nations promptly developed training simulators for their armed forces. Computer, micro-processor, and laser-based training simulators mushroomed and found wide uses in weapons training and tactical exercises in the various branches of the armed forces. Experience has proved that such training simulators are highly effective.

Although China's armed forces made a late start in the development of training simulators, they have made rapid progresses in recent years and have reached advanced levels in certain areas. In 1985 China held a military-wide training simulator exhibit and a simulated battle exercise using lasers and electronic equipment. The development of military training simulators in China has advanced from profile and mechanical simulation to computer, laser, and electronic simulation; from technical simulation to tactical simulation; from one branch of the armed forces to the tactical command of an integrated operation; from the simulation of ground battles to the simulation of ground, sea, and air battles of combined arms. A preliminary survey shows that more than 400 training simulators are currently in use or will soon be put into use.

I. Computer-based Simulators

The heart of a computer-based simulator is the computer of the microprocessor. The development of computers has eliminated many of the mechanical devices in an electromechanical simulator. The employment of microchips has greatly aided the miniaturization of simulators.

Weapon training simulators: A computer-based simulator allows the quantification of combat principles, environmental conditions, military force, weaponry, command and control, and efficiency and describes the entire battle process with a simplified mathematical model. Computer-based simulators include weapons training simulators, and more sophisticated simulators for battlefield command, control, communications, information, and electronic warfare. For example, the divisional and regimental commander tactical

training simulator is built on an IBM PC-AT microcomputer using machine language. The hardware includes the main frame, monitor, printer, and the graphic input board. The software consists of a main control program and 13 subroutines on graphics, interference, command, and so on. The system is capable of both man-machine exercises and enemy-home team confrontation simulation to train the personnel. Other computer-based simulators include the division/regiment battle training simulation system, the Fast-Simulate model 1 exponential battle simulation system, the model 82-I ground artillery firing command simulator, and the submarine torpedo attack simulator.



Fig. 1. Jian-7 Take-off, landing simulator

Operator simulators: Operator simulators include ground vehicle driving simulators, aircraft pilot simulator and ship navigation simulator. Computers and microelectronics technologies have continually increased the accuracy and sophistication of simulators. Such simulators can vividly display the movement of vehicles, tanks, and aircraft and simulate 2° of freedom of the simplest ground vehicles or 6° of freedom of aircraft movement. The operator simulators can even simulate the different smells and minute differences in vehicles and aircrafts and thereby greatly reduces the training time and efficiency. Examples are the advanced driving simulator for the model JMC-1 tank, the navigation training simulator for HL-II, the flight simulator for the Qiangji-5, and the portable flight simulator for the Jian-5 fighter.

Maintenance simulator: Computer-based maintenance simulators have been developed for units equipped with advanced tanks, artillery, missiles and aircrafts. The computer may simulate the possible malfunctions, allow the trainee to respond with a repair method, and then judge the correctness of the method. Simulators have been developed for the tracking mechanism of the model BDP-II altazimuth and the electrical maintenance training station.

The wide application of computer based simulators will undoubtedly promote the development of software technology including the standardization of programming and write format and the application of advanced computer languages.

II. Laser Simulators

Since its debut, the laser has found many uses in military training simulation. In the early 1960's, West Germany developed a ruby laser simulator. Today, simulators built on He-Ne lasers and semiconductor lasers are available. In the Chinese armed forces, we have single-soldier laser simulators and lasers and electronic simulation systems for integrated tactical confrontation. The

unique features of laser allowed us to stop relying on the traditional real ammunition target practice and tactical exercises. Laser simulators provide the soldiers with realistic training and allow the various branches of the armed forces to respond quickly to sudden changes in a combined operation. Laser simulators can also train the soldiers for battle command and field maintenance under any terrain conditions.

In the future, we should strive for major breakthroughs. The direction for future developments are: Make the simulation more realistic and effective by using the newly developed electro-optic display, computer imaging, automatic control and microelectronic technology, and 2) serialize, standardize, and modularize the simulators so that they are more compatible in part and as a whole.



Fig. 2. Laser receiver on Qiang-5 aircraft.

9698/9435
CSO: 4008/50

Computers

OPTIMUM NONREDUNDANCY OVERLAY ALGORITHM FOR MULTI-OUTPUT TWO-LEVEL 'AND-OR' NETWORK

Shenyang XIAOXING WEIXING JISUANJI XITONG [MINI-MICRO SYSTEMS] in Chinese
No 9, 8 Sep 85 pp 1-7

[Article by He Quanlai [0149 0356 0171] and Xue Hongxi [5641 1347 3356] of
Qinghua University]

[Abstract] With advances in intermediate and large-scale integrated circuits, the programmable logic array (PLA) has been extensively applied; PLA is a multi-output two-level "and-or" network nonredundancy overlay. In general situations, the nonredundancy overlay obtained from these algorithms achieves minimization. Even if the minimization is not attained, the outcome is near-minimization in most cases. The authors call it, low-order overlay. One table compares features of algorithms A, B, C, and D. The authors wrote programs for these algorithms in PASCAL and FORTRAN languages. These programs can be executed in computers with small random access memory (28K to 32K).

REFERENCES:

1. Muroga, Sabur, LOGIC DESIGN AND SWITCHING THEORY, 1979.
2. [Compiled by] Brewer, M.A., SHUZU JISUANJI SHEJI ZIDONGHUA DI LILUN HE FANGFA [THEORY AND METHOD FOR DESIGN AUTOMATION OF DIGITAL COMPUTERS], Science Publishing House, 1978.
3. Xue Hongxi, He Quanlai, and Chen Xiuhuan [7115 0208 3883], ZHONGXIAOXING JISUANJI [INTERMEDIATE AND SMALL-SIZED COMPUTERS], No 6, 1981.
4. Luan, D. (United Kingdom), [translated by] Zhao Xingyao [6392 5281 5069], et al., SHUZI XITONG JISUANJI FUZHU SHEJI [SUPPLEMENTARY DESIGN OF DIGITAL SYSTEM COMPUTERS], Science Publishing House, 1983.

HOW TO CONTINUE OPERATIONS WHILE PRINTING OUT FILES

Shenyang XIAOXING WEIXING JISUANJI XITONG [MINI-MICRO SYSTEMS] in Chinese
No 9, 8 Sep 85 pp 15-27

[Article by Feng Huanqing [7458 3562 3237], China University of Science and Technology]

[Abstract] This paper describes how to write a virtual off-line program under the CP/M operating system, so that a user can continue operating the computer while printing files. Programs stated at the conclusion of the paper can be executed on other 8-bit microcomputers supported by other CP/M. One figure shows the distribution of internal memory before and after the virtual off-line program was installed. Three tables show the virtual off-line program, its assembly procedure, and the spool buffer removal program.

REFERENCES:

1. Gabel, David, "Printer Buffers and Spoolers," PERSONAL COMPUTING, July 1983, pp 78-83.
2. Zhang Gongzhong [1728 0361 1813], et al., CP/M WEIXINGJI CIPAN CAOZUO XITONG [MAGNETIC DISK OPERATING SYSTEM OF CP/M MICROCOMPUTER], 1982.
3. Department of Computer Science, Nanjing University, CP/M2.2 CHENGXU QINGDAN [PROGRAM LIST OF CP/M2.2], 1983.

MICROCOMPUTER APPLICATIONS IN SUMMARY OF ACCOUNT TITLES

Shenyang XIAOXING WEIXING JISUANJI XITONG [MINI-MICRO SYSTEMS] in Chinese
No 9, 8 Sep 85 pp 43-46, 14

[Article by Ma Hongzhi [7456 3163 1807] and Luo Dongling [7482 0392 0134] of
Harbin Institute No 627, Ministry of Aeronautics Industry]

[Abstract] This article mainly presents a microcomputer management system, a mathematical model, the program design approach, and the main functions for account titles. Also described are application features of this management system, developed on an APPLE model II microcomputer using a Chinese character system in Tianlong [4920 4430] coding. According to design requirements, the credit and debit amounts with the balance (and the running subtotal) of various accounting items of the general account can be computed. Consolidation into the corresponding account can be accomplished for the credit and debit amount of the various accounting items, thus producing a chessboard type statement for the current amount. All transactions in number sequence can be included in the printout; this is the format of a journal register serving the function of time sequence general account. A figure shows nine subroutines of the control program.

DESIGNING, IMPLEMENTING MANAGEMENT SYSTEM FOR GRADING CADRE SERVICES

Shenyang XIAOXING WEIXING JISUANJI XITONG [MINI-MICRO SYSTEMS] in Chinese
No 9, 8 Sep 85 pp 52-58, inside cover

[Article by Li Shi [2621 1395], Computer Station, Machinery Manufacturing
Plant, Anshan Steel Mill]

[Abstract] This paper presents an application of fuzzy set theory on a micro-computer; the comprehensive evaluation of cadres, and the method and principle of quantitative analysis are introduced. Also introduced are the design and implementation procedure of other functions in the cadre administrative system, as well as some methods adopted for coping with the problems of small memory storage and slow computation speed of the microcomputer in the system's design procedure. The cadre administrative grading system was written in an expanded BASIC language on a made-in-China BCM microcomputer. The printout is in the Chinese language; the grading program began operations in June 1984. Technical certification was granted. Three figures show the system general flowchart, cadre grading program flowchart, and research program flowchart. Some methods in fuzzy set theory have been applied in the cadre grading system. The mathematical methods and programs used in the system can also be applied to other administrative operation if slight modifications are made.

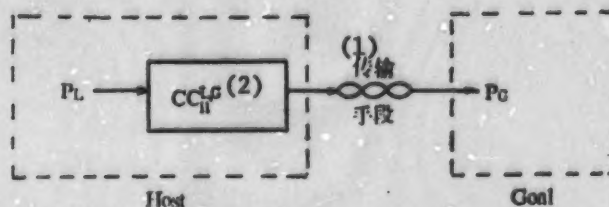
10424/9365
CSO: 4009/1043

MIXED DEVELOPMENT TOOL--CROSS COMPILER

Shenyang XIAOXING WEIXING JISUANJI XITONG [MINI-MICRO SYSTEMS] in Chinese
Nos 10-11, 8 Nov 85 pp 112-119

[Article by Yang Shetang [2799 4357 1016] and Lai Xiangfei [6351 5046 7378]
of the Shenyang Institute of Computer Technology, Chinese Academy of Sciences]

[Abstract] The paper first discusses how to engage in mixed development and to design an effective algorithm for adequate utilization of the software available for the host computer in order to achieve language cross compilation between the host and goal computers. Then concepts of UNCOL and the design philosophy of pattern matching algorithms are presented for better design efficiency in cross compilation and for enhanced compatibility of system software in the host computer. Finally, the paper introduces a cross development environment with the host system in a Unix configuration and with the C language on an LSI-11/23, and the goal--in Z80 series processors. In addition, cross compilation and code generating routine are detailed. As shown by the authors' practice, cross compilation can serve effectively in solving the software compatibility problem between different computers. The authors develop the following mode between the host and goal computers: L~language [H~G] cross compilation.



Flowchart of Cross Compilation

- Key: 1. Means of transmission
2. $CC_H^{L,G}$ indicates L language (cross) compiling of Goal in the Host (CC is cross compiler).

Five other figures show multigoal cross compilation, its transfer, software cross development environment of C language in Unix, code generating program (flowchart) and its mode of cross compilation.

REFERENCES:

1. Brown, P.J., et al., [translated by Zhu Guanming [2612 7070 6900] et al., RUANJIAN YIZHI [TRANSPORT OF SOFTWARE], Science Publishing House, 1982.
2. Lai Xiangfei and Wu Lifu [0702 0448 1133], "Low Level Compatible Software Tool--TLP," XIAOXING WEIXING JISUANJI XITONG, April 1983.
3. Partsch, H. and Steinbruggen, R., "Program Information System," COMPUTING SURVEYS, Vol 15 No 3, September 1983, pp 201-236.
4. Einarsson, B. and Gentelman, W.M., "Mixed Language Programming," SOFTWARE PRACTICE AND EXPERIENCE, Vol 14 No 4, April 1984, pp 383-395.
5. HARE Ad-hoc. Committee on Universal Language, "The Problem of Programming Communication With Change Machine: A Proposed Solution," CACM, Vol 2 No 8, 1958, pp 12-17.
6. Ganapathi, M., Fischer, C.N., and Hennessy, J.L., "Retargetable Compiler Code Generation," COMPUTER SURVEYS, Vol 4 No 4, December 1983.
7. VoC'fe, Martin I., et al., "The Ada Language System," COMPUTER, June 1981, pp 37-45.
8. Stenning, Vic., et al., "The Ada Environment: A Prospective," Ibid., pp 26-36.
9. Yang Shetang (instructor: Lai Xiangfei), "Production and Transfer of a Compatible System," A thesis for MA, Shenyang Computer Technology Institute, November 1984.
10. Lai Xiangfei and Yang Shetang, "C-Code Grammar Structure and Its Chinese Code Tool," JISUANJI GONGCHENG YU YINGYONG [COMPUTER ENGINEERING AND ITS APPLICATIONS], No 2, 1985.

10424/9365

CSO: 4009/1044

ENERGY LOSS OF RELATIVISTIC ELECTRON BEAM IN MAGNETIZED PLASMA

Chongqing HEJUBIAN YU DENGLIZITI WULI [NUCLEAR FUSION AND PLASMA PHYSICS]
in Chinese Vol 6 No 1, 15 Mar 86 pp 1-5

[English abstract of article by Huang Lin [7806 2651] of Southwestern
Institute of Physics, Leshan, Sichuan]

[Text] In this paper, the energy loss of a relativistic electron beam (REB) in magnetized plasma has been investigated. We derived the general expression for the energy loss and expanded it in terms of small parameters. Up to the lowest order, the final analytical expression of the energy loss of REB has been obtained. In the absence of an applied magnetic field B_0 , it reduces to R.A. Gerwin's result. Finally, we have numerically analyzed the dependence of the energy loss on the parameters. The results show that in some parameter ranges the magnetic field has an important effect on the energy loss of REB.

EQUILIBRIUM AND STABILITY OF TOROIDAL REVERSED FIELD PINCH

Chongqing HEJUBIAN YU DENGLIZITI WULI [NUCLEAR FUSION AND PLASMA PHYSICS]
in Chinese Vol 6 No 1, 15 Mar 86 pp 6-10

[English abstract of article by Zhang Peng [1728 7720] of Southwestern
Institute of Physics, Leshan, Sichuan]

[Text] An analytical expression of the equilibrium configuration has been derived for the toroidal reversed field pinch. Suydam's condition and the sufficient criteria have been examined. The parameter regions have been determined for which the necessary or sufficient criteria of instability are satisfied. The numerical calculations coincide with the experimental results of HBTX 1 and TPE-1R(M).

ANOMALOUS SLOWING DOWN MECHANISM FOR ION STREAM DURING INJECTION OF HIGH ENERGY NEUTRAL BEAM

Chongqing HEJUBIAN YU DENGZITIZI WULI [NUCLEAR FUSION AND PLASMA PHYSICS] in Chinese Vol 6 No 1, 15 Mar 86 pp 11-16

[English abstract of article by Guo Shuyin [6753 2579 0603] of Southwestern Institute of Physics, Leshan, Sichuan]

[Text] In this paper it is pointed out that there may be an anomalous slowing down mechanism for an ion stream instead of Fokker-Planck diffusion during the injection of a neutral beam when the injection energy is very high.

The slowing down time τ_s for classical and anomalous mechanisms has been obtained. The relationship between τ_s and U_{ib} , the velocity of the ion stream, is quite different for these two mechanisms. The change rates of the kinetic energy $E_{||}$, parallel to the magnetic field B_0 , and $E_{\perp}$, perpendicular to B_0 , have been calculated.

When the injection direction is nearly perpendicular to B_0 , the results show that $dE_{||}/dt > 0$ and $dE_{\perp}/dt < 0$ due to the electromagnetic instability with $K \parallel B_0$ induced by the ion stream.

IMPLoding PLASMA FOR X-RAY LASER RESEARCH

Chongqing HEJUBIAN YU DENG LIZITI WULI [NUCLEAR FUSION AND PLASMA PHYSICS]
in Chinese Vol 6 No 1, 15 Mar 86 pp 17-22

[English abstract of article by Yang Zhenhua [2799 7201 5478], Wang Guirong [3769 6311 2837] and Tian Shihong [3944 0013 3163] of the Institute of Applied Physics and Computational Mathematics, Beijing]

[Text] In this paper we discuss the physical process of imploding plasma driven by a high power pulsed generator. It is very difficult to solve the nonlinear kinetic equations describing the plasma. Introducing some simplifications, we have derived a set of analytical formulas. The discrepancy between analytical results and numerically computed results is less than 5 percent. It is shown that the generators with parameters similar to PITHON (power 3-4 TW, output electrical energy 300-400 kJ) could produce high temperature imploding Krypton plasma with a total mass of 200-400 μg , electron temperature higher than 1 keV and density between 10^{20} - 10^{21} cm^{-3} . The produced plasma meets the conditions necessary for verifying the theory of neon-like X-ray lasers.

PULSE DISCHARGE CLEANING OF HL-1 TOKAMAK VACUUM VESSEL

Chongqing HEJUBIAN YU DENGLIZITI WULI [NUCLEAR FUSION AND PLASMA PHYSICS]
in Chinese Vol 6 No 1, 15 Mar 86 pp 23-26

[English abstract of article by Li Guodong [2621 0948 2767], et al., of
Southwestern Institute of Physics, Leshan, Sichuan]

[Text] The HL-1 Tokamak was test-operated on 21 September 1984. During the period of vacuum conditioning, including 60 hours of baking of up to 200°C and 7×10^4 shots of pulse discharge cleaning, the calculated quantities of carbon and oxygen removed were equivalent to 24 and 6 monolayers, respectively. Then, 124 shots of Tokamak discharge were performed with low level plasma parameters. The plasma current and pulse length achieved were 60 kA and 85 ms at the toroidal magnetic field of 15 kG. This paper describes the techniques used and the effect on discharge characteristics of bakeout and pulse discharge cleaning of the vacuum vessel.

X-RAY BACKLIGHTING DIAGNOSTICS IN LASER PLASMA RESEARCH

Chongqing HEJUBIAN YU DENGLIZITI WULI [NUCLEAR FUSION AND PLASMA PHYSICS]
in Chinese Vol 6 No 1, 15 Mar 86 pp 33-38

[English abstract of article by Lin Zunqi [2651 1415 3825], et al., of
Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences]

[Text] The design of an X-ray backlighting diagnostic system is described, with rules for selecting the main and accessory targets and X-ray filters. Preliminary experimental results are presented. A new technique incorporating a fast-speed streak camera and optical fiber has proven more efficient for time synchronization adjustment among the backlighting beam and the two main laser beams. The discrepancy of time synchronization among the three laser beams was about 10-20 ps.

MEASUREMENT OF SOFT X-RAY FLUCTUATIONS USING VACUUM PHOTOELECTRIC DETECTORS

Chongqing HEJUBIAN YU DENGGLIZITI WULI [NUCLEAR FUSION AND PLASMA PHYSICS]
in Chinese Vol 6 No 1, 15 Mar 86 pp 39-43

[English abstract of article by Li Linzhong [2621 2651 1813] and Wang Zhengmin [3769 2973 3046] of the Institute of Plasma Physics, Chinese Academy of Sciences, Hefei, Anhui]

[Text] In this paper the principle and structure of vacuum photoelectric detectors (VPD) are described. Results of measurements on soft X-ray (SX) fluctuations using VPD are presented for a Tokamak plasma with $\bar{T}_e$ of 100 eV. The SX signals can be observed when T_{e0} is approximately equal to or greater than 110 eV. The typical sawtooth waveforms of the internal disruptive $m = 0$, $n = 0$ mode, the signals of low mode number disturbances and disruptive instability have been observed. Effects of applied helical fields on the disruptive instability have been studied.

THE MANUFACTURE OF COSM θ PROBES AND THEIR APPLICATIONS TO HT-6 TOKAMAK

Chongqing HEJUBIAN YU DENGLIZITI WULI [NUCLEAR FUSION AND PLASMA PHYSICS]
in Chinese Vol 6 No 1, 15 Mar 86 pp 44-47

[English abstract of article by Chen Jiayu [7115 0163 7457], et al., of the
Institute of Plasma Physics, Chinese Academy of Sciences, Hefei, Anhui]

[Text] In this paper the principles and manufacturing technology are
described for the cosm θ type probes ($m = 2, 3, 4$) used on the HT-6 Tokamak.
It is demonstrated that the probes have good characteristics for making
Fourier analysis instantaneously. The probes are especially suitable for
studying the rapid magnetic fluctuations from the disruptions. Typical
oscillograms during the steady and disruptive stages are presented.

9717

CSO: 4009/86

NEW TWO-DIMENSIONAL SCAN METHOD OPERATED BY SCANNING RADIOMETER IN EARTH SYNCHRONOUS ORBIT

Shanghai HONGWAI YANJIU [CHINESE JOURNAL OF INFRARED RESEARCH] in Chinese Vol 5A No 1, Feb 86 pp 1-6

[Article by Pei Yuntian [5952 0061 1131], Shanghai Institute of Technical Physics, Chinese Academy of Sciences]

[Abstract] Since the spin axis of a satellite is parallel to the earth's axis, the satellite's rotation around its spin axis permits scanning along the east-to-west direction on the earth with a scan radiometer; the stepping motion along the south-to-north direction is accomplished by the radiometer itself. One type of scanning layout is an arrangement in which the telescope as well as the principal mirror, secondary mirror, and folding mirror constitute an entity in a south-to-north ($\pm 10^\circ$) stepping motion. The satellite rotates around the z axis; and the telescope rotates around the y axis as shown in the following figure:

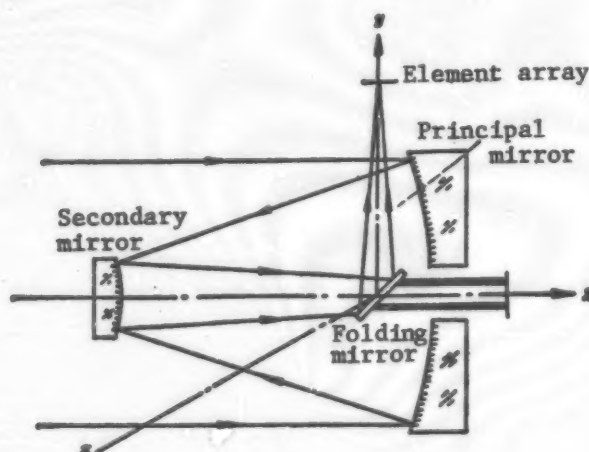


Figure 1. Assembly of Scan Radiometer for Meteosat

The article briefly discusses scanning methods used for the scanning radiometer operating in an earth synchronous orbit. As shown in the figure, a new method (not including a swinging mirror) for this scan is proposed. The accuracy of this scan method is analyzed.

Five other figures show the scan track of scan radiometer for the SMS (synchronous meteorology satellite) and the Meteosat, the stepping assembly with two sets of the scanning system, and feasible locations of radiometer in the telescope assembly in the satellite. The author is grateful to Kuang Dingbo [0562 1353 3134] for his suggestions. The article was received for publication on 25 August 1985.

INFRARED ABSORPTION, RAMAN SCATTERING OF $a\text{-SiN}_x\text{:H}$ THIN FILMS PREPARED BY GD TECHNIQUES

Shanghai HONGWAI YANJIU [CHINESE JOURNAL OF INFRARED RESEARCH] in Chinese
Vol 5A No 1, Feb 86 pp 7-15

[Article by Song Yizhou [1345 0076 0719], Jiang Wendi [1203 2429 1229] and Fang Rongchuan [2455 1369 1557] of Department of Physics, China University of Science and Technology]

[Abstract] Infrared absorption and Raman scattering of $a\text{-SiN}_x\text{:H}$ thin films prepared by GD (glow-discharge) are investigated. The vibration absorption peaks of NH_4Cl were detected in samples prepared by GD in gas mixture of $\text{SiCl}_4 + \text{N}_2 + \text{H}_2$. The bonding of $a\text{-SiN}_x$ films is discussed. After thermal annealing at different temperatures, a change in infrared absorption due to Si-N_x vibration is observed. Two bonding forms for Si and N may exist in the films; one of them is SiN , and the other is Si_3N_4 . Raman scattering of the stretching vibration mode of Si-N bond is also studied. Ten figures show the infrared absorption of $a\text{-SiN}_x\text{:H}$ thin films; relations between T_g (temperature at the base stratum of the preparation device) on the one hand, as well as C_N (nitrogen content), N/Si and H/Si , on the other; the relation between $\nu_{\text{Si-H}}$ (Si-H elongation-vibration frequency) and electronegativity sum of substituent atoms, as well as various relations between T_A (annealing temperature) and other parameters; the density of the phonon state of C-Si; and the reduced Raman spectra of $a\text{-SiN}_x\text{:H}$, as well as the relative scattering intensities versus x . Two tables list data on the positions of the absorption peak of Si-H key versus T_g , and the scattering peak Γ (of TO) versus T_g . The first draft of the article was received on 16 April 1985; the revised draft was received for publication on 2 October 1985.

10424/9365
CSO: 4009/64

Physics

JET CHARGE CROSS SECTION METHOD

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 35 No 2, Feb 86
pp 141-151

[English abstract of article by Tu Dongsheng [2629 2639 3932] of the Institute of High Energy Physics, Chinese Academy of Sciences; Yang Xine [2799 2450 1230] of the Department of Physics, Tianjin University; and Luo Ma [5012 7456] of the Department of Physics, Nankai University, Tianjin]

[Text] We propose a scheme called the Jet Charge Cross Section Method. In this method, the results of calculations in perturbative QCD are not only less affected by the sea quark and gluon distribution functions in hadrons, just like in the calculations of the cross section difference of hadrons ($d\sigma(AB \rightarrow h^+X) - d\sigma(AB \rightarrow h^-X)$), but are also independent of any fragmentation functions of partons. In addition, it is possible to measure the mean electric charges of various quark jets indirectly without distinguishing the quark flavors.

BIREFRINGENCE IMAGES OF SCREW DISLOCATIONS VIEWED END-ON IN GGG AND YAG CRYSTALS

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 35 No 2, Feb 86 pp 188-195

[English abstract of article by Ge Chuanzhen [5514 0278 3791], et al., of the Institute of Solid State Physics, Nanjing University]

[Text] Birefringence images of screw dislocations in Gadolinium Gallium Garnet (GGG) and Yttrium Aluminum Garnet (YAG) crystals are studied in detail. Birefringence images of screw dislocations viewed end-on were observed for the first time. The one-to-one correspondence between birefringence images of screw dislocations viewed end-on and those viewed from the side was demonstrated. The contour of equal intensity of the birefringence image of screw dislocations viewed end-on in GGG and TAG crystals was derived by considering the photo-elastic anisotropy of garnet, and the results are in good agreement with experimental observations.

INELASTIC NEUTRON SCATTERING STUDY ON ACOUSTICAL ACTIVITY OF $\text{Bi}_{12}\text{GeO}_{20}$ AND $\text{Bi}_{12}\text{SiO}_{20}$

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 35 No 2, Feb 86
pp 196-202

[English abstract of article by Tao Fang [7118 2499] and Lin Quan [2651 2123] of the Institute of Physics, Chinese Academy of Sciences; Zhang Taiyong [1728 3141 3057] of the Department of Physics, University of Science and Technology of China, Hefei; Niu Shiwen [3662 0013 2429], et al., of the Institute of Atomic Energy, Chinese Academy of Sciences; and Shi Zhongjian [2457 0112 1017] of the Institute of Acoustics, Chinese Academy of Sciences]

[Text] Acoustical activity of isomorphous crystals $\text{Bi}_{12}\text{GeO}_{20}$ and $\text{Bi}_{12}\text{SiO}_{20}$ has been studied by measuring the splitting of degeneracy of transverse acoustical waves propagating along a high symmetric direction with inelastic neutron scattering. One of the interesting results is that the left and right circularly polarized modes of acoustical phonons propagating along the $\langle 111 \rangle$ direction are subjected to different attenuations. This conclusion is verified by both kinds of crystals. The experimental results have been observed for the first time in the study of acoustical activity. The lifetime of the phonon with larger attenuation is found to be about 2×10^{-11} s. experimentally.

ELECTRONIC IMPACT EXCITATION CROSS SECTIONS AND RATES. I. SPIN ALLOWED EXCITATION PROCESSES

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 35 No 2, Feb 86 pp 203-212

[English abstract of article by Tian Bogang [3944 0130 0474] and Li Jiaming [2621 1367 2494] of the Institute of Physics, Chinese Academy of Sciences]

[Text] Based on two properties of the generalized oscillator strength densities (1. continuity in an excitation and 2. quasiscaling relation along an isoelectronic sequence), the corresponding parameters in Bethe's formula (namely Bethe's physical parameter set) have similar behaviors. According to Bethe's formula, excitation cross sections for spin allowed processes can be calculated easily in terms of Bethe's physical parameter set which characterizes the excitations of target atoms. In the present article, we introduce corrected functions defined as the ratios between the exact cross sections and Bethe's cross sections. The corrected functions reveal a nice universal scaling feature within 50 percent. Thus, various cross sections as well as rates, which correspond to electron impact excitations from an initial state to infinite final states, forming a so-called "excitation channel," can be obtained conveniently.

TIME-RESOLVED SPECTRA STUDIES OF ArF^* AND Ar_2F^* EXCIMERS UNDER FAST-DISCHARGE EXCITATION

Beijing WULI XUEBAG [ACTA PHYSICA SINICA] in Chinese Vol 35 No 2, Feb 86
pp 228-234

[English abstract of article by Gu Zhiyu [7357 0037 3768] and Wang Shaoying [3769 4801 5391], et al., of Anhui Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, Hefei]

[Text] The formation and quenching kinetics of ArF^* and Ar_2F^* have been studied by investigating their time-resolved spectra. Analysis shows that the decay process of ArF^* depends on the time evolution of its main precursor Ar^* , but that of Ar_2F^* is determined by its own effective lifetime. Therefore, the two-body quenching rate constant of Ar^* by F_2 , three-body quenching rate constant of Ar^* by Ar , two-body quenching rate constant of Ar_2F^* by He , Ar and F , and the radiative lifetime of Ar_2F^* can all be determined.

9717

CSO: 4009/67

Thermophysics

SOME COAL-BURNED AFB COMBINED CYCLE AND COGENERATION SCHEMES

Beijing GONCCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS]
in Chinese Vol 6 No 3, Aug 85 pp 218-221

[English abstract of article by Cai Ruixian [5591 4213 6343] of the Institute
of Engineering Thermophysics, Chinese Academy of Sciences]

[Text] Some coal-burned atmospheric fluidized bed (AFB) gas-steam turbine
combined cycle and cogeneration schemes--AFB afterburned combined cycle, AFB
hot water cogen, AFB hot air cogen and AFB steam cogen--are proposed and their
thermodynamic analysis and performance is presented. It is shown that these
schemes are feasible and valuable when parameters are selected appropriately.

INVISCID-VISCOUS ITERATION TECHNIQUE TO PREDICT AXIAL COMPRESSOR CASCADE FLOW AND PERFORMANCE

Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS]
in Chinese Vol 6 No 3, Aug 85 pp 226-231

[English abstract of article by Liu Songling [0491 2646 7881] of Northwestern Polytechnic University]

[Text] The inverse mode of the lag-entrainment method is used to predict both separated turbulent boundary layers and wakes, and a new iteration technique suggested by Carter is applied to combine the inverse mode boundary layer calculation with a time marching inviscid flow analysis. It is found that this technique is applicable for obtaining a convergent solution for separated cascade flow. For a high subsonic double-circular-arc axial compressor cascade, the calculated Mach number distributions on the blades, downstream flow angles and total pressure loss coefficients are in good agreement with experimental results in the optimum incidence range. In the design incidence range the agreement between calculated results and experimental ones is not satisfactory.

TIME MARCHING METHOD FOR CALCULATING UNSTEADY FLOW FIELDS AROUND VIBRATING CASCADES

Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS]
in Chinese Vol 6 No 3, Aug 85 pp 232-237

[English abstract of article by Jiang Zikang [5592 3320 1660], et al., of Qinghua University]

[Text] In this paper stable nonsteady flow fields around vibrating cascades are calculated by use of a time marching method in which vibrating meshes are adopted. In order to reduce the calculating time, the steady flow field derived with a time marching method is used as the initial field, and the calculating mesh is posed to vibrate with the cascade. Time marching is continued until the calculated parameters vary with time periodically with stable amplitudes and phases of vibration. Three calculating examples are presented, and one of them is compared with the experimental values of a similar cascade showing the effectiveness of this calculating method.

CALCULATION OF UNSTEADY AERODYNAMIC FORCE CAUSED BY OSCILLATION OF SUPERSONIC CASCADE

Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS]
in Chinese Vol 6 No 3, Aug 85 pp 238-244

[English abstract of article by Fan Feida [5400 7236 6671] of Northwestern Polytechnic University]

[Text] A set of equations for calculating the unsteady aerodynamic force of a supersonic plate cascade, whose leading edge and trailing edge are of an arbitrary curve shape, has been developed by means of the singularity method. A program and unsteady aerodynamic work caused by oscillation of a sweepback supersonic plate cascade were provided as an example of its application. This program can provide information to predict the possibility of flutter for the designed supersonic cascade. It is important in guiding the design of the cascade and avoiding unstalled flutter.

STUDY OF HEATING AND EVAPORATION PROCESSES OF SINGLE COAL-WATER SLURRY DROPLET UNDER FORCED CONVECTION

Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS]
in Chinese Vol 6 No 3, Aug 85 pp 279-283

[English abstract of article by Fu Weibiao [0265 4850 2871] and Li Yinghua [2621 2019 5478] of Qinghua University]

[Text] The heating and evaporation processes of a single coal-water slurry droplet under forced convection have been studied in this paper, and the calculation models have been established. The calculation results are in good agreement with experimental results, so they can be used for estimating heating and evaporation time of a single coal-water slurry in engineering applications.

9717
CSO: 4009/68

- END -

JPRS-CST-86-023

12 JUNE 1986

China Report

SCIENCE AND TECHNOLOGY



FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

12 JUNE 1986

CHINA REPORT SCIENCE AND TECHNOLOGY

CONTENTS

PEOPLE'S REPUBLIC OF CHINA

NATIONAL DEVELOPMENTS

S&T Operating Expense Management Discussed (Bei Mu; KEXUEXUE YU KEXUE JISHU GUANLI, No 2, 1986).....	1
Research Institutes Gain Tax Exemption (XINHUA, 14 Apr 86).....	7
Table of Patent Applications by Country (ZHONGGUO ZHUANLI, No 1, 1986).....	8
Science, Technology Markets Discussed (JISHU SHICHANG BAO, 25 Mar 86).....	9
Lin Zongtang on S&T Conference Song Jian on S&T Future	9 11
Li Peng on 'Protectionist' Policy on Electronics Products (ZHONGGUO XINWEN SHE, 23 Jan 86).....	13
Shaanxi Plans To Develop Electronics Industry (Shaanxi Provincial Service, 17 Mar 86).....	14
Meeting Stresses Digital Display Technology (Wang Yanrong; XINHUA, 19 Apr 86).....	16
Science, Technology System Controls Discussed (Huang Ze; KEXUEXUE YU KEXUE JISHU GUANLI, No 2, 1986)....	17

Beijing Technology Import Statistics Reported (Chen Zhiqiang; BEIJING KEJIBAO, 26 Feb 86).....	22
S&T Personnel Encouraged To Hold 'Spare Time' Jobs (various sources, various dates).....	24
Questions, Answers, Liu Zhenyuan Interview	24
Laws, Provisions Described	26
S&T Laws Become Necessary, by Yu Renbo	28
Shanghai S&T Market Activity Described (Yao Shihuang; WEN HUI BAO, 11 Mar 86).....	31
Patent Litigation Process Described (Fei Zonghui; ZHONGGUO ZHUANLI, No 1, 1986).....	33
Importance of Patent Law in Technology Competition Discussed (Wang Wenjiang; ZHONGGUO ZHUANLI, No 2, 1986).....	38
Aspects of Military Support of Civilian Goods Production Analyzed (Cheng Lianjun; HANGKONG ZHIZAO GONGCHENG, No 9, 1 Sep 85).....	41
National Chemical Conference Ends in Beijing (Beijing Domestic Service, 29 Apr 86).....	47
Scientific Research Awards Ceremony (XINHUA, 15 May 86).....	48
Application of S&T Research Results Discussed (Yang Zhonglian; GUANGMING RIBAO, 23 Mar 86).....	49
Scientific Exploration Team To Explore Chang Jiang (XINHUA, 20 May 86).....	52
Scholastic Activities at China University of S&T Described (Zhu Guanghua; ANHUI RIBAO, 26 Feb 86).....	53
Jiaotong University's Support of Local Economy Discussed (Zhang Guangqiang; SHAANXI RIBAO, 11 Mar 86).....	55
Briefs	
Qinghai Monopolizes Silicon Market	56
PHYSICAL SCIENCES	
Holographic Study of Vibration of Underwater Sound Transducer (Liu Jilu, et. al.; SHANDONG HAIYANG XUEYUAN XUEBAO, 15 Dec 85).....	57

APPLIED SCIENCES

Propulsion Engineering Research Described (GUOJI HANGKONG, No 11, Nov 85).....	64
---	----

ABTRACTS

AERODYNAMICS

KONGQIDONGLIXUE XUEBAO [ACTA AERODYNAMICA SINICA] Vol 4, No 1, Mar 86.....	68
---	----

COMPUTERS

JISUANJI KEXUE [COMPUTER SCIENCE] No 4, 23 Aug 85.....	74
--	----

OPTICS

GUANGXUE XUEBAO [ACTA OPTICA SINICA] Vol 6, No 2, Feb 86.....	76
---	----

GUANGXUE XUEBAO [ACTA OPTICA SINICA] Vol 6 No 3, Mar 86.....	84
--	----

/12675

NATIONAL DEVELOPMENTS

S&T OPERATING EXPENSE MANAGEMENT DISCUSSED

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENTIOLOGY AND MANAGEMENT OF S&T]
in Chinese No 2, 1986 pp 31-33

[Article by Bai Mu [2672 2606], State Science and Technology Commission: "Some Facts About Reform of Management of Science Research Operating Expenses"]

[Text] According to the "CPC Central Committee Resolution Regarding Restructuring of the Science and Technology System," we must restructure science research operating expenses in order to strengthen overall management of science research operating expenses, give full play to the function of economic levers, promote the catering to society of research units, catering to building of the economy, rational and effective use of science research operating expenses, and the gain of even greater social and economic results.

I. We must unify responsibility for managing science research operating expenses.

With a central unified management of science research operating expenses and by linking operating expenses with research tasking and achieving overall control and balance we can achieve the following results:

1. From the view of overall management, we will break up the "common pot," and we will allocate and use science research operating expenses in accordance with the needs of the development of science and technology in this country.

Based on actual economic power in this country and on the development of future science and technology, there should be reasonable proportions and allocation of expenses for basic research, applications research, technology development, and dissemination of applications, as well as work on technical fundamentals, social benefits, and scientific and technical service. After a few years of adjustment, this should get progressively more reasonable. Funds allocation between departments ought to be based on our development strategies. Some should be enhanced, some should be decreased, and some should be maintained. We should change the "even handed" methods of the past, and with a few years of effort we can set up a science and technology system that suits the characteristics of this country. Effecting this sort of change cannot be done by any one particular department, for that would always be limited. It can only be done by all departments governing the full range of development of science and technology.

2. A unification of research operating funds with the management of research tasking.

Management of science research operating expenses will merge from purely financial management into the management of science and technology to become an important component of science and technology management. Linking tasking with funding will unify the management of funds and the management of scientific and technical tasking. From now on, higher level management departments will be selective in support, basing that support upon the amount of research tasking assumed by a research institute, the quality, the pricing, and length of time in order to create a situation of professional competition. With this transformation we will gradually eliminate the fragmented science and technology system situation in this country.

3. We will progressively change the nature of science research operating expenses, and will integrate them with the three expenses of science and technology into professional development funds, which will allow use of research operating funds to be more and more reasonable.

According to relevant papers and resolutions, using reduced operating funds to establish science and technology development funds that cater to professions, or to shift to science funds, and bring this together with the three expenses will form primary funding sources for departmental development of science and technology. This would be true even for units implementing responsibility systems. As reforms of the science and technology system develop, research operating expenses, the three expenses of science and technology, capital construction expenses, and technology transformation expenses should be combined for management, and setting up our own categories of science and technology management and giving full play to the function of economic levers will accelerate the development of our science and technology.

4. We will collect dispersed "small monies" into "large money," promoting the development of science and technology in this country.

The disparate nature of science and technology funding is a large defect in current scientific and technical management, and research expenses are even more so. Collecting "small monies" together into "big money": a portion of operating expenses reduced from each department each year; operating expenses that grow each year; use of small quantities of science and technology loans deducted from science research operating expenses. Combining these three portions together would provide a significant amount of science and technology expenses. The only way we can reach this point is by implementing centralized management of science and technology operating expenses. Otherwise, it cannot be done. The results of this collection of "small monies" into "big money" will be recognized by even more comrades after some years of effort and practice.

II. Categorical Management of Science Research Structures

First, various categories of science research structures for science and technology activities of different characteristics are uniformly allocated

money on the basis of "head counts." There are 10,000 institutes eating from the nation's "public grain" in this kind of situation--apart from the large number of science research organizations independent of enterprises. No other country in the world has this situation. Due to limitations in the national financial capabilities, science research operating expenses allocated by the state each year are only enough for wages and daily expenditures, little is used as research expenses. Therefore, after research conditions in the vast majority of research institutes declined, research quality lessened, economic results were deficient, and most of the research was low quality repetition.

Second, only by orienting to society, to the basic levels, and to production, and by integrating with production can research units engaged in technology development generate achievements and produce economic results. And those research units engaged in basic research and applications research ought to be oriented to the world and to the front ranks of science research to develop those disciplines or fields that China ought to develop. For these things, to not practice categorical management would be to smother the energy in each category of research structure itself. A large number of science research organizations in technology development work that could find funding sources from various channels had no enthusiasm because of the "big pot" in research operating expense allocations, which affected basic research (the strengthening of which should have been stressed), applications research, and some general technical research, to the extent that the science and technology base in this country is rather weak.

It is our belief that when there is categorical management in keeping with the characteristics of the scientific and technical activities of research organizations the difficulties noted above can be overcome and avoided. At the same time as we encourage technology development to orient to society and implement technology contract systems, we should pay attention to strengthening applications research, as well as to providing stable and sustained development conditions for basic research. This will allow research work of all different types to have what they need and to develop in coordination.

Categorical management of science research organizations will in the first place bring guarantees of research funding; second, research directions will be clearer and more specific, avoiding blindness; and third, leadership energies will be more concentrated.

III. How To Solve Problems in Funding Self-Sufficiency

We will progressively promote a technology contract system for work in technology development and for applications research from which we might expect near term practical value. Independent research organizations primarily engaged in this kind of work ought to obtain income and accumulate funds in the process of creating economic results for society through the means of contracting for projects in national planning, accepting commissioned research, transferring the rights to technical achievements, jointly funded development joint export operations, and consulting services. Operating expenses formerly allocated by the state will be progressively reduced, and we will work so that within the shortest possible time the majority among these

research organizations can be basically self-sufficient in operating expenses. The fundamental requirements by which these research organizations will practice self-sufficiency in operating expenses are:

First, in principle the state should no longer allocate operating expenses, which is the primary indication of operating expense self-sufficiency.

Second, under that premise, daily administration and business expenditures for each unit will be taken care of by each unit.

Third, implement a fixed asset depreciation and equipment renewal system. This is an excellent link for maintaining the economic activity of research units. If national assets are not discounted or are only "symbolically" discounted, then there will be no source for equipment renewal funds for research units and they will actually be taking part of national investments, and will certainly not be truly self-sufficient in operating expenses. In this way, the millions and even billions of yuan worth of fixed assets currently held by research units will be nearly completely consumed in less than 20 years, and there will be nothing from which to draw. Of course, for particular instruments and equipment for which investment is high and the rate of use is low, the renewal problems could be solved through the method of nationally subsidized secondary purchase expenses.

Fourth, take the responsibility for personnel training expenses.

It should be pointed out that after research units have become self-sufficient, they will not only be unlike the old sense of "research service," but will be different in nature from enterprises. Aside from the wages and benefits for departing and retiring personnel and training expenses for graduate students that should be allocated by the state, self-sufficient research units should not accept favorable circumstances from the state that the average enterprise cannot accept.

1. Enterprises must turn over various sorts of tax revenues in responsibility for social and public expenditures, and only under this premise can the profit and loss question be discussed, and the great majority of tax revenues from science research units (as for example for new products, transfer of rights to technology, and technical service fees) should be deferred or reduced.

2. In the use of funds, when enterprises use national fixed assets and circulating funds, that use is compensated. Moreover, capital construction funds needed in the future for enterprise expansion and reproduction will not be again funded by the state but will be changed to a system in which this is resolved by bank credit or by funds from the enterprises. Research unit current fixed asset and circulating capital may continue to be used for free. Future capital construction funds needed by research units for expansion should for the most part be invested by the state through methods of preferential support, and at the same time can also be handled through the methods of bank credit and privately raised funds.

3. Looking at it from the point of view of income sources, the income of enterprises is completely dependent upon commodity production and operations,

while income for research units is partially from technology reserve research projects, aside from a dependence on commodity operations (technical commodities and non-technical commodities), and they can also apply to the state for expense subsidies.

In summary, the distinctions between this type of research organization and enterprises correspond to the characteristics of research work and the needs of the national economy and of technology development, and this should be a long term policy for this nation. We should not see this as contemporary measures and expediencies for the China of the present. We recommend that from now on when this country formulates relevant policies (as for example allocation policies, tax revenue policies, and credit policies), that we distinguish this type of research unit from general service units and enterprises. We do not want to say "they are all the same," and we neither want to treat this kind of unit the same as general service units, but also do not want to treat this kind of unit as if it were an enterprise.

We should explain problems in the significance of the phrases "self-sufficiency in funds," "funds independent," and "self-sufficiency in operating expenses." It is our belief that both "self-sufficiency in funds" and "funds independent" both indicate that expenditures of research units are handled by those units, and that there is no difference in concept between the two phrases. "Self-sufficiency in operating expenses" is a minimal requirement for "self-sufficiency in funds", for otherwise these research units cannot speak of attaining "self-sufficiency in funds."

IV. What is the Significance of Funds Responsibility?

It was pointed out in the "Resolution" that for research units engaged in socially beneficial service, such as medicine and hygiene, labor protection, family planning, disaster prevention, and environmental science, as well as those organizations engaged in scientific and technical services such as information, standards, measurements, and observation and in work on technology fundamentals, the state should still allocate funds, and that there should be funds responsibility. Operating expenses for organizations that disseminate and research agricultural technology would still be allocated by the state. We should encourage and support qualified units as they progressively reach self-sufficiency in operating expenses.

How shall we understand the significance of funds responsibility? At present, many comrades have explained it thusly:

First, the state should provide as much funds as are needed.

Second, taking 1985 as a base, this should grow annually.

Third, all expenses should come under funds responsibility, whether or not it is for information, standards, or measurements in that research organization.

There is a certain prejudice to each of these three concepts. The restructuring of the science and technology system itself is to break up the "big common pot" and to link up science research tasking with funds

management, and this principle is also suitable for units implementing funds responsibility. Essentially speaking, for these research organizations to implement funds responsibility is fundamentally the same as for units engaged in technology development to implement a technology contract system. This is because:

First, fund allocations are dependent upon the amount of responsibility assumed and the quality, and it is no longer a situation where either doing something or not or doing it well or not makes no difference.

Second, the guarantee is not complete. Tasking can be authorized and guarantees can be undertaken under the premises of pricing, duration, and quality, and in a similar way there can be competition. When the tasking undertaken has not been satisfied, the state will not be fully responsible for a portion of the people concerned. This will encourage them to orient to society and engage in all operations.

Third, aside from encouraging completion of tasking contracted from higher authorities, it will also encourage catering to society, carrying out technical services, and obtaining economic results.

Where this is different from the technology contract system is that the research achievements from these research organizations are needed by the state, but the majority cannot constitute technical commodities, no one will buy them at technology markets, but they should be purchased by the state. Therefore, when the state undertakes funds responsibility for this sort of research organization, these organizations will similarly be confronted with consolidation and restructuring, and some among them will join with enterprises or will combine internally within the system. They will also be confronted with the problems of "closure, suspension, merging, and retooling." For these reasons management of this sort of research organization should be undertaken according to the following methods:

1. Reevaluate the scope of service for the unit in question, determine groups and personnel and calculate a work index.
2. Implement funds responsibility according to the tasking that has been undertaken.
3. Appraise and decide upon operating expenses once, let what is saved be retained, and do not compensate overspending.
4. Take into account the annual work responsibility index, and in those cases where, for subjective reasons, the tasking was not completed, the following year's funds responsibility index should be adjusted.
5. Encourage qualified units (or work) to implement technology contract systems or fund systems.

12586
CSO: 4008/2090

NATIONAL DEVELOPMENTS

RESEARCH INSTITUTES GAIN TAX EXEMPTION

OW150005 Beijing XINHUA in English 1940 GMT 14 Apr 86

[Text] Beijing, 14 April (XINHUA)—Chinese research institutions will get a new incentive to transfer their knowledge and provide technological services as the Ministry of Finance has promised to reduce or exempt taxes on their activities.

According to a new tax rule made public today by the Ministry of Finance, the research institutions will be exempt from business tax and income tax on their earnings from technological transfer, offering technological services, training, contracting for technological development projects and exporting technology.

The product tax and the value added tax on the research and development of new products will be reduced for a fixed period of time and the amount of tax payments reduced are required to be used for technological developments, according to the new tax rules, which came into effect 1 April.

The research institutions are also encouraged to lease their idle instruments and equipment. The income derived from the leasing will be free from income tax if they are used to buy new equipment, the Ministry of Finance said.

To encourage research institutions to invest in energy projects and communications facilities and in development projects in old revolutionary base areas, regions inhabited by minority nationalities and border regions, the ministry said, the income tax on the returns of their investments will be cut by 50 percent within 5 years and, if they reinvest their earnings, the income tax will be exempt.

/12232
CSO: 4010/2017

NATIONAL DEVELOPMENTS

TABLE OF PATENT APPLICATIONS BY COUNTRY

Beijing ZHONGGUO ZHUANLI [PATENT REVIEW IN CHINA] in Chinese No 1, 1986 p 16

[Text] Patent Applications from Major Countries and Hong Kong, October 1985

unit: individual item

Country or Region	Total (April-- October)	Total (this month)	Inven- tions	Functional New Model	Indus- trial Design	Non-job Related Inven- tion	Job Rela- ted Inven- tion
Japan	1,453	139	126	2	11	7	132
U.S.	972	116	113	1	2	4	112
West Germany	407	37	35	2		4	33
Netherlands	199	12	12			1	11
United Kingdom	168	6	6				6
Switzerland	132	8	8				8
France	114	11	11			1	10
Hong Kong	96	7	1	2	4	3	4
Italy	67	11	11			1	10
Australia	67	5	5				5
Sweden	58	8	8			2	6
Hungary	45	7	7			4	3
Austria	36	3	3			1	2
Canada	35	6	5		1	1	5
Denmark	30						
Belgium	22	1	1				1
Finland	15	1	1				1
USSR	5	1	1				1
Spain	2	1	1			1	
Others	76	6	5	1		2	4
Totals	3,999	386	360	8	18	32	354

12586

CSO: 4008/2094

NATIONAL DEVELOPMENTS

SCIENCE, TECHNOLOGY MARKETS DISCUSSED

Lin Zongtang on S&T Conference

Tianjin JISHU SHICHANG BAO in Chinese 25 Mar 86 p 1

[Text] In the closing ceremonies of the recently convened All-China Technology Market Working Conference, Lin Zongtang [2651 1350 2768], Vice Minister of the State Science and Technology Commission and deputy group leader of the All China Technology Market Coordination and Guiding Small Group, made a summation report on "actively opening up technology markets and promoting enterprise technology advances."

Lin Zongtang said that technology markets are the product of restructuring, they are the creation of the masses, and they have a great vitality. They have created the conditions for restructuring of the science and technology system, and have strengthened the power and motivation for the self development of scientific and technical units; they have opened new paths for hastening the absorption, and assimilation of new ideas from imported new technology; they have accelerated the great diversion, great acceptance, and great improvement of our technical achievements, and have opened up a vast scope for the abilities of the broad mass of scientists and technicians; and we have powerfully motivated lateral integration of the economy and technology, and have powerfully accelerated the coordinated development of our economy. He said that technology markets are the bridge and link for the lateral joining of village and city, between production enterprises, and between production and research units, and that they will develop lateral economic amalgamations, which will be sure to greatly develop the technology markets. At the moment, our technology markets have developed sufficiently. For this reason we will maintain the principles of "opening up, invigorating, supporting, and guiding," will greatly increase development, will give a free hand, will explore many areas, and will exhaustively push the technology markets toward a new stage. In each sector and each region, all who are qualified will actively open up the technology markets, and at the same time will give autonomy to the technology markets to allow them to break through the fragmentation and truly give full play to the bridging function of lateral relations.

Comrade Lin Zongtang also said that in opening up the technology markets, adjusting organizational structures in the science and technology system, and encouraging the joining of research, educational, and design organizations with production units, the goal is to strengthen the capacity for technology

absorption and development, which will invigorate the economy and serve the four modernizations. Currently, economic development in this country needs to solve three problems: 1) production structures must be further adjusted to meet the needs of modernization of the national economy, improvement in the people's standards of consumption, and changes in consumption structures; 2) to resolutely shift the focus of construction to technical transformation and renovation and expansion of existing enterprises, and to go the way of internally stressed expansion and reproduction; 3) to correctly handle regional economic development relations, and spur the rationalization of regional economic distribution. To implement the tasks just described, we must greatly intensify the capacity of enterprises to absorb and develop technology. He also said that when technology is a commodity it is most important to sell it to enterprises. The development of technology markets ought also to proceed from the needs of the buyer, and we should organize technology trade well, wholeheartedly serve the technical advancement of enterprises, and serve the improvement of product quality, reductions in energy consumption, development of new products, and improvement in productivity.

When he was speaking about focusing on our economic construction needs during the period of the "7th 5-Year Plan" and the work that the technology markets should do, he said that we should pay close attention to the shift of foreign technology to the interior, the shift of coastal technology to the interior, the shift of urban technology to the countryside, and the shift of military technology to civilian use. We should coordinate well and energetically improve the capacity of enterprises for exporting and earning foreign exchange, and should especially greatly improve our capacities for exporting electromechanical production. We should develop lateral economic and technical relations, and improve social, economic, and technical results.

Comrade Lin Zongtang said that in opening up the technology markets and developing lateral economic relations, we must provide support from policies and provide protection with laws. We should adopt strong measures to urge the close integration of production with science and technology, and to spur on the combining of production enterprises with research units, in which research units would be primary or where production units could be primary, recruiting the participation of research units. Management departments of both parties should be actively encouraged and supported. Economically combined organizations will strengthen the capacity for technical development, through lateral amalgamation can absorb research units as their own development structures, can serve the technology development work of combined organizations, and can also permit them to serve other enterprises and units. Science research units joining in amalgamation can continue to enjoy the tax preferences for independent research units and there will be no increase or decrease in their operating expenses. We should actively support intermediate experiments in the amalgamation of production enterprises and research units, for which managing departments will make arrangements for in planning.

12586
CSO: 4008/2096

Song Jian on S&T Future

Tianjin JISHU SHICHANG BAO in Chinese 25 Mar 86 p 1

[Text] At the closing ceremonies of the recently held All-China Science and Technology Working Conference, State Science and Technology Minister in Charge Song Jian said that during the "7th 5-Year Plan" restructuring of the entire economic system a great framework will be established, that restructuring of the science and technology system will follow suit, and that technology markets should also get on track during the "7th 5-Year Plan." We will strengthen confidence, enhance management, be actively supportive, and run the technology markets well.

Comrade Song Jian also said that during the "7th 5-Year Plan," our scientific and technical front lines are facing changes in production structures and consumption structures. There will be advances in the technical transformation of existing enterprises, increases in the number of key science and technology projects, and meeting the challenge of the new world technology revolution will pose a large number of important topics for urgent resolution by science and technology. With completion of the tasking just described, and aside from a portion that will be organized and implemented through national planning, a great number of tasks will be realized through the bridges that are the technology markets. Comrade Song Jian also said that in opening up the technology markets we have come across a path by which to allow science and technology to rapidly transform into direct production forces. In this aspect, we will not yet have met the needs of economic construction and development. Therefore, we will strengthen confidence, and with an unflagging spirit will maintain and carry on in the direction of the commercialization of technology, for otherwise, the restructuring of our science and technology system will have no future.

Comrade Song Jian pointed out that it should be admitted there are still some problems in the technology markets, primarily in the fact that laws and regulations are not complete, the standards for laws and regulations are not clear, and the policies that should accompany development have not caught up. We will strengthen management, and will especially enhance building of the legal system. We will resolutely correct unhealthy tendencies existing in the technology markets, for otherwise our restructuring will falter and our technology markets will be destroyed. Those who violate the laws should be punished according to the law, but we cannot refrain from acting in fear of

failure just because individuals do wrong. He hoped that all areas and all departments pay special attention to this.

Comrade Song Jian concluded by saying that if the technology markets flourish and develop, that will prove that our enterprises are already depending upon science and technology, that they have the capability to absorb and assimilate science and technology. And it will also prove that our research organizations are catering to the economy and that they have shifted to the correct track of development. Then, our nation and our mission will take off for new heights from this point. Realization of this goal requires adoption of powerful support policies. Right now, comrades in finance, banking, and tax revenue departments are already actively studying and formulating policies to strongly support the opening and development of technology markets.

12586

CSO: 4008/2096

NATIONAL DEVELOPMENTS

LI PENG ON 'PROTECTIONIST' POLICY ON ELECTRONICS PRODUCTS

HK271500 Beijing ZHONGGUO XINWEN SHE in Chinese 1231 GMT 23 Jan 86

[Text] Beijing, 23 Jan (ZHONGGUO XINWEN SHE)--Vice Premier Li Peng said today, beginning with 1986, China's electronics industry will pursue an appropriate protectionist policy regarding its microcomputer and electronic parts products. All that can be produced in China which meet the requirements should be supplied domestically in the main.

Li Peng made this statement at the National Conference for Leading Cadres of the Electronics Industry which concluded this afternoon.

Li Peng said, China's electronics industry has, in recent years, imported a number of production lines for parts and microcomputers, which has played an active role in the development of the electronics industry. At present, China has already gone in for the production of 8- and 16-bit microcomputers in batches, and the production of electronic parts is up to certain standards. Therefore from now on, China should take itself as the base regarding those electronics products which China is capable of producing and the quality of which is guaranteed. In order to appropriately control imports, China is to pursue a protectionist policy regarding its electronics products.

According to him, marked accomplishments have been scored in the development of China's electronics industry. The gross output value of the electronics industry was 28 billion yuan in 1985, doubling the index of the annual plan, with a volume of 4 billion yuan in interest and taxes handed over to the state. From now on, the electronics industry should organize its forces to digest, absorb, and develop the imported technologies and to create something new with them, while incessantly improving our capability in design and development and upgrading the standards of China-made products.

/12858

CSO: 4008/1061

NATIONAL DEVELOPMENTS

SHAANXI PLANS TO DEVELOP ELECTRONICS INDUSTRY

HK240147 Xian Shaanxi Provincial Service in Mandarin 2300 GMT 17 Mar 86

[Text] The experts and professors who had come from inside and outside this province to attend the Shaanxi Study and Discussion Meeting on Invigorating Electronics pointed out: To readjust the arrangements for electronics, to develop economic relations among enterprises and regions, and to give full play to the advantages of technology and qualified personnel, is the necessary way to invigorate our province's electronics industry. In accordance with the views of the experts and professors, the meeting worked out a strategic program for invigorating the electronics industry in our province.

The strategic program points out: Although the electronics industry in our province has taken initial shape, the majority of the units are set up in mountainous areas. This has affected giving play to the advantages of the electronics industry. Therefore, during the Seventh 5-Year Plan period, the arrangements of the electronics industry in our province must be readjusted on a large scale. At the same time, the central authorities, provincial authorities, and enterprises concerned will invest 1.4 billion yuan to build three electronics industry cities in Xian, Xianyang, and Baoji.

The strategic program at the same time points out that to develop economic relations among enterprises and regions and to carry out management of the whole trade is the necessary policy decision to invigorate the electronics industry in our province. In the future, we must break the bounds of different departments, between departments and places, and of different places, and gradually form six large economic combines--television sets; electronic components and parts; semiconductor and microelectronic technology; computers; special communications equipment; and mould-making tools, and carry out specialized production and the management of the whole trade.

During the Seventh 5-Year Plan period, the annual gross value of the electronic industrial output of our province will reach 3 billion yuan and the amount of exports \$40 million. By the end of this century, the annual output value will reach 10 billion yuan. The electronics industry will become the first large industrial trade in the whole province.

The electronics industrial technology and qualified personnel in our province rank first in the whole country. During the Seventh 5-Year Plan period, in conjunction with the importing of technology and with reform of the scientific and technological structure, we must further give play to the advantages of technology and qualified personnel and gradually ensure that our electronic products are made by our country.

/12858

CSO: 4008/1061

NATIONAL DEVELOPMENTS

MEETING STRESSES DIGITAL DISPLAY TECHNOLOGY

OW201421 Beijing XINHUA Domestic Service in Chinese 1607 GMT 19 Apr 86

[By reporter Wang Yanrong]

[Excerpts] Beijing, 19 Apr (XINPUA)--When a digital display device is installed on a machine tool, the worker who operates the machine will not have to use a measuring instrument to measure the pieces the machine is processing and can easily and accurately determine the extent of processing work done. This reporter was able to observe this at the "on-the-spot meeting on remolding machine tools with digital display technology" held by the State Economic Commission and other departments at the 7 February Locomotive Plant under the Ministry of Railways today.

China has been engaged in studying and developing digital display technology for more than 10 years and has made relatively big progress in recent years. Those enterprises which adopted digital display technology all gained significant technical and economic benefits.

In order to promote the experience in remolding old machine tools with digital display technology, the National Office for Promoting Mechanical and Electronic Technology, the Equipment Management Office of the State Economic Commission, and the Beijing Municipal Economic Commission jointly sponsored the on-the-spot meeting.

Zhu Rongji, vice minister in charge of State Economic Commission, spoke at the meeting. He said: Using microcomputers and digital display devices to remold old machine tools is an important way to transform traditional equipment with new technology. It is technically reliable and has significant economic results. At the same time, it provides opportunity for using electronic technology and is conducive to the development of the electronics industry. This work is quite significant.

The 7 February Locomotive Plant, the No 1 Heavy Machinery Plant under the Ministry of Machine-Building Industry, and the Beijing Municipal Digital Display Technology Service Center introduced their experiences in promoting digital display technology at the meeting. Comrades concerned of 21 ministries and commissions under the State Council attended today's on-the-spot meeting.

/12858
CSO: 4008/1061

NATIONAL DEVELOPMENTS

SCIENCE, TECHNOLOGY SYSTEM CONTROLS DISCUSSED

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENTIOLOGY AND MANAGEMENT OF SAT]
in Chinese No 2, 1986 pp 17-18

[Article by Huang Ze [7806 3419], Shanxi Provincial Science and Technology Commission: "On Control of the Science and Technology System"]

[Text] Control of the science and technology system has especially important significance for economic and social development, and problems in the following areas should be studied theoretically:

1. The laws of science and technology system structures, functions, and developments.
2. Science and technology management and the laws of the process of economic regulation of science and technology internal operations, among which are included the macroscopic black box method, the middle-view grey box method, and the microscopic white box method, allowing the integration in principle of self-regulation and self-organization in scientific and technical activities like strategies for scientific and technical development, scientific and technical forecasting, scientific and technical planning, changes in the allocation system, implementation of a compensated contract system, and the exploitation of technical fields.
3. Scientific and technical information, the processing and management of data, analysis and research, and retrieval services improve the creative capacity and research efficiency of scientists and technicians, and can as well reach the goal of controlling and strengthening system functions.

The structure of our national science and technology system is an irrational, hierarchical, multi-rung structure. If we allow science and technology to cater to building of the economy, that would be allowing this system to manifest a rational system structure through external control and by changes in the internal system, and to even more effectively implement its complement of functions.

When studying the control of science and technology systems, we should primarily concentrate on the management process. Macroscopically, we should focus on how this large system of science and technology adapts to the needs

of the economy and realize control of the science and technology system in the areas of strategy, policy, regulations, planning, and funding. We should coordinate the externals and internals of the system to accomplish a rational adjustment of the system structures and reach the goal of enhancing its functions. Microscopically, from the research institute to the topic group, emphasize the strengthening of science and technology and the economy through responsibility systems, technical contracts, and making the most of operational structures in the technology markets. Emphasize also the lateral relationships of social development, and invigorate the science and technology in a region, or a department, or a research unit to allow smooth implementation of the entire functions of the strengthened science and technology system.

There are the following aspects to the primary methods for science and technology system control:

1. Control of Science and Technology Policies

In order to suit the requirements of the coordinated development of our science and technology, economy, and society and the changing situation that is the new world technology revolution, current science and technology policies ought to study new science and technology system structures and science and technology internal operational structures, major investment directions for personnel and finance, and should selectively import and assimilate foreign advanced technology, hasten the dissemination and application of scientific and technical achievements, strongly develop knowledge, strengthen the management of science and technology, etc.

In substance, science and technology policies are a combination of both the economic and the scientific and technical, and they have a very strong controlling function in the science and technology system. Therefore, when studying the control of the science and technology system, we want first of all to study science and technology policies.

2. Control of Science and Technology Planning

In the old science and technology system, science and technology planning was an extremely important component in promoting the development of scientific and technical activities. It was just this sort of planning system that restricted the energy of the science and technology system and made research planning for research units depend upon higher levels, that made scientific and technical achievements depend upon the state for dissemination, that allowed research units to not care about competition in the marketplace, not care about renewal of commodities, and that allowed them to seriously lack the motivation to cater to building of the economy. In the new science and technology system, whether we want science and technology planning and how it would be planned are important aspects of controlling the science and technology system.

The key to restructuring the system of planning for science and technology is in changing the directive planning in science and technology system operations to focusing on planning that is guiding in nature. Under the new planning

system, aside from major planning projects of a strategic significance for the nation, the trend is for the functions of planning and regulation to progressively diminish, and in the areas of lateral relations in science and technology and the economy, the functions of technology market regulation and the requirements of a commodity economy will tend to strengthen, and this will generate a group of "short, level, and quick" projects that will be closely connected with local economies.

The emphasis when restructuring the science and technology system is on the correct integration of overall guidance and low level invigoration. In the situation in which overall guidance of science and technology is strengthened, the focus for restructuring planning should be placed on low level invigoration. This is because development of a commodity economy and the structures of an open economy demand that 90 percent and more of national scientific and technical capacity cater to the technical transformation of enterprises, cater to constant renewal of commodities, and cater to vigorous competition in international markets.

Our new science and technology system to a very great degree depends upon the ability of the new science and technology planning to control operations in the science and technology system. If we say that science and technology policies are the "software" with which to control this system, then the new science and technology planning is a portion of the "hardware" by which to control this system.

3. Control of Science and Technology Information

There is no end to scientific and technical information for scientific and technical fields today, and these days, when science and technology are developing so rapidly, there are about 14,000 papers published on an average day throughout the world that contain new knowledge. Each minute a new book is published, and an average of more than 100 patents come out each day. In the face of great quantities, overlapping, and rapid growth of scientific and technical information, scientists and technicians are always falling into the difficulties of not being able to find something, not being able to understand something, and not being able to finish reading something. Therefore, if work involving scientific and technical information is not done well, this will obstruct the improvement of research efficiency.

In the collection of information, analytical processing, retrieval, and editing belong to the internal control of information system functions; information selection service, backtrack retrieval service, and computer networks are under the external control of information system functions. Controllability of systems requires that the system be organized. Therefore, the control of scientific and technical information is the effective handling of the internal and external behavior of information systems. Strengthening the control of this kind of organized behavior is an important means by which to strengthen the control of information.

4. Control of Science and Technology Legislation

If the science and technology system has only policy, planning, and information control, that will be neither complete nor full scale. We must add the coordination and restrictions from external environmental conditions before we can control the science and technology system in a full scale way. Science and technology legislation is the external environment and limiting condition under which the science and technology system can be assured of undertaking effective activities, it can accelerate the rapid application of scientific and technical achievements in everyday social life, especially in economic fields, and can prevent the generation of harmful consequences. The relations generated between the development of science and technology in the developed countries of the United States, Japan, the Soviet Union, and West Germany and the regulation of scientific and technical activities have to a great degree relied upon science and technology legislation for implementation. Therefore, to realize effective control of the science and technology system in our country we must strengthen our work on science and technology legislation.

There are still many problems in this country in the area of science and technology legislation, as well as many gaps, and we must systematize science and technology legislation as quickly as possible.

Perfection of science and technology legislation will allow the strengthening of control over the science and technology system, and will allow for more coordination in the development of science and technology, the economy, and society.

In sum, control of the aspects of policy, planning, information, and legislation are interacting at the same time in the science and technology system, and it is they that accomplish the goal of control.

Control of the science and technology system is the same as control of any other system, that is, we want to maintain system operations within specific allowable limits. More broadly, there are two goals for control:

1. Controlling changes in the system and maintaining the stability of the system.
2. Accelerating changes in the system and reaching a new anticipated state.

However, for the old stable state to undergo changes and reach a new stable state is not an easy matter. Therefore, there will be an evolutionary process, and if there is new overall control and everything is done at once, then when the new stable state is reached it is certain to create omissions in control, and there will be difficulties for the rational adjustment of system structures and for the joining in control of the coordination, overall view, middle view, and low level view of system internal operational structures. This is because new states cannot completely eradicate older states, but can only progressively fulfill and enrich itself in the process of disintegration of the old state in accordance with the overall requirements and directions of the new state, finally reaching a new stable state. In the situation of this

transition stage or when the new and old states exist concurrently, the following three problems should be well considered:

First, is the perfection of the new control measures. The new control methods and measures are the principles, measures, and guarantees by which the science and technology system goes from one state to another. However, in the change that realizes a system state, new control measures are certainly not perfect nor mature, and some are exploratory. Therefore, we should pay close attention to the study of new method and measures, and should avoid occurrence whereby old control methods become ineffective and where new control methods are largely blind. That would cause disturbances of ineffectiveness in the system, and would waste time, personnel, and finances.

Second, is centralized control and dispersed control. Having centralized control and dispersed control is a principle in control theory. It is a hierarchical principle for controlling and using a large system. Our national science and technology system is highly organized, there is much multilevel management, i.e., the often mentioned five front armies, while local systems are also divided into science and technology commission systems, various office systems, and local enterprise systems. Were there not the aspect of hierarchical control, there would be a blockage of information with wrangling between levels, while creating a situation of control imbalance and confusion. In a rationally organized hierarchical control system, each portion controlled by another level is a unified entity to execute a particular function. It is also coordinated uniformly in its behavior by its own controlling goals and by the overall goals of the system. Therefore, we must have hierarchical control at different levels. Without that, there would be no objective control. As for example when in the past we said "things die as soon as they are controlled, and things get confused as soon as control is released." Therefore, under the requirements of the overall goals and overall principles for the overall control of the entire science and technology system, we want to be sure to do a good job when studying hierarchical control and make overall, middle level, and lower level control coincide.

Third, is the evaluation of control results. Evaluation of the results of controls is the determination of the degree of control in this system, but it is not a question of using a mathematical model to solve for the optimization of science and technology system control. How shall we evaluate the results of system control? Science and technology system control results should be the economic and social results generated by manpower, material power, and financial power functioning under determined control measures and methods within a certain time.

12586

CSO: 4008/2089

NATIONAL DEVELOPMENTS

BEIJING TECHNOLOGY IMPORT STATISTICS REPORTED

Beijing BEIJING KEJIBAO in Chinese 26 Feb 86 p 1

[Report by Chen Zhiqiang [7115 1807 1730]: "Technology Importation In This City Is Developing Rapidly"]

[Text] Reporters have learned from the technology transformation working conference held recently in Beijing that the scale and depth of technology importation in this city in 1985 once again had new development. A total of 325 deals were reached with foreign interests for a total financial volume of \$320 million. This surpassed that of 1984, which had been the highest volume in history. At the same time, this city also won seven support projects from the United Nations development support office, for a total volume of \$9.8 million.

Last year, among the 325 technology importation projects in this city, 149 (45.8 percent) involved standards of the 1980's and 176 (54.2 percent) involved standards of the 1970's. For example, among those with advanced standards were intelligent instrumentation technology, helium-neon laser devices, nuclear magnetic resonance spectrometers, graphics facsimile machines, optic fiber production equipment, and optic fiber external waveguide production technology.

Among technology importation work in this city last year, the focus was on complete sets of equipment for the goal of domestic production. Fourteen projects (total transaction amount of \$15.45 million) were contracted for by the municipal broadcast television industry general companies and 9 projects were key components in manufacture technology imported for the domestic production of color televisions (a total transaction volume of \$13.24 million), which accounted for 85 percent of the total volume. To better improve the domestic production process for refrigerators and washing machines, this city imported temperature controller and evaporator manufacturing technology, as well as equipment for washing machine plastic injection molding.

Among the technologies imported last year, this city continued to stress support of industries of preferential development. There were 35 transactions regarding food product transactions (total transactions of \$35.18 million), 11 percent of the total transactions. There were 41 projects for the electronics

and precision instrumentation industries at \$47.73 million, or 14.9 percent. There was a great increase in transactions for the building materials industry, contracting for 18 projects altogether for \$26.26 million, or 8.2 percent. This was double that of last year. There were 96 projects for the textile industry (a volume of \$60.36 million) for 18.8 percent. The motor vehicle industry had 18 projects for \$19.09 million and 6 percent. At the same time, attention was also paid to arranging for technology importation for the raw materials industries.

12586

CSO: 4008/2091

NATIONAL DEVELOPMENTS

S&T PERSONNEL ENCOURAGED TO HOLD 'SPARE TIME' JOBS

Questions, Answers

Shanghai WEN HUI BAO in Chinese 12 Mar 86 p 1

[Interview with Liu Zhenyuan, deputy mayor, Shanghai Municipality by Yao Shihuang [1202 6108 3552] and Fudan University journalism department trainee, Zhang Wan [4545 4111]: "How Shall We Regard Concurrent Spare Time Jobs for Scientists and Technicians?"; at Shanghai Academic Conference on Technology Markets, 11 Mar 86]

[Text] Deputy Mayor Liu Zhenyuan [0491 2182 0337], who attended the Shanghai Academic Conference on Technology Markets, responded yesterday morning to reporter's questions on the problem of concurrent spare time jobs for scientists and technicians.

Question: "At the moment, there have been some disturbances regarding the question of concurrent spare time jobs for scientists and technicians. Could we hear your views on this question?"

Answer: "On this question of concurrent spare time jobs for scientists and technicians we still go on the basis of the resolution of the CPC Central Committee regarding restructuring of the science and technology system: when they do not violate the rights of the host unit nor affect the current job, we should permit concurrent jobs for scientists and technicians in their spare time. Of course, we must strengthen our leadership and management to an appropriate degree. This is because, on the one hand, an individual's abilities and energies are always limited. To be a unit leader and be worried about staff having another job, about a dispersion of energy, about it affecting the main job, these concerns can be understood. Therefore, we must strengthen leadership at the first job, there must be indices for amount of work done, and there must be accounting. Concurrent work must also be moderate. However, because intellectuals are currently not numerous, if we are to make full use of their enthusiasm we should permit scientists and technicians to have concurrent jobs in their spare time. We should clearly differentiate "on the job" from "outside the job," and if scientists and technicians are employed in their spare time, engaged in intellectual activity, then they ought to be permitted autonomy."

Question: "At the moment, some units are investigating the income for scientists and technicians from spare time work, and some people have been evaluated as advanced but have been held back. How should this be dealt with?"

Answer: "When scientists and technicians engage in spare time work, they receive a certain compensation for their labors, which is permissible and legal. If there are unhealthy practices going on, then of course they should be investigated. But we cannot see legal income from spare time work as being from unhealthy practices, or see it as ill-gotten wealth. If there are unhealthy practices in the process of engaging in spare time work, these should be investigated and corrected."

Question: "When scientists and technicians engage in spare time consulting activities, how can we distinguish "organization" from "self"?"

Answer: "After studying this we feel that any consulting activity for organizations like the science association, professional associations, and staff technology associations should be labeled as organizational, and for scientists and technicians to take part in this sort of consulting activity is not self-employment."

When reporters asked finally about how the municipal government is going to enhance leadership and management in regard to spare time employment, Liu Zhenyuan said, "We have already decided that on the basis of provisional measures drawn up by relevant departments, municipal government regulations on consulting will be formulated and published as soon as possible based on rather complete provisions and methods drawn up after study of relevant aspects."

12586

CSO: 4008/2091

Laws, Provisions Described

Beijing GUANGMING RIBAO in Chinese 23 Mar 86 p 1

[Text] In the current rectification of unhealthy tendencies, some units have opposed the legitimate remuneration earned by scientists and technicians at jobs in their spare time. For example, some have made internal investigations about or transferred scientists and technicians who in the first phase had extra jobs or participated in consulting activities; some have confiscated the income of scientists and technicians from these jobs; some have wanted party members to clarify this question during party rectification, or otherwise they would not approve of their membership; some have even aroused the masses to "expose the problem." All of these actions are wrong.

The "Resolution by the CPC Central Committee Regarding Restructuring of the Science and Technology System" has already clearly ruled on this question of spare time jobs for scientists and technicians: "Under the prerequisite that they must complete the work of their primary jobs and that they cannot violate the technical rights or the economic results of the host unit, scientific and technical personnel may engage in technical work and consulting services in their spare time, and may retain the income thereof; the unit must agree if they are to use technical achievements, internal technical materials, or equipment that belongs to the host unit, and a portion of the income should be turned over as well." When scientists and technicians have not violated the provisions just described, engaging in spare time work activities is appropriate and legal. Their legal right to this ought to be protected, and if they make outstanding contributions in that spare time work activity, they should make the same kind of outstanding contributions in their primary work, should be commended, and should not be censured, or attacked, without reason.

Spare time work for scientists and technicians is an effective method by which to make up for the insufficient numbers of scientists and technicians as we restructure the economic system and in this situation where science and technology is so urgently needed in all areas. The social and economic results that they bring along are very obvious. First, they have promoted lateral economic relations and have improved the capabilities for technology development and transformation in enterprises, and have especially made beneficial contributions to the development of township and town enterprises. Second, they have promoted the integration of science research with production. Scientists and technicians with concurrent work have opened up

the two way flow of information between production and science research, they have rapidly brought technology into production and have also fed back production problems and market information into the research institutes. They have enriched the substance of science research and have even created new research topics. Consequently, this has allowed research units to strengthen their economic, marketplace, and process outlooks. And this is an important matter for the restructuring of the science and technology system. Third, they have aided the exchange of knowledge, they have expanded the fields of knowledge of scientists and technicians, have urged the catering to production by scientists and technicians, and they have moved in the directions of society. Consequently, they have trained a group of scientific and technical talent that understands science and technology, understands the economy, understands laws and regulations, and understands the all-around development of trade. We should accurately evaluate spare time jobs for scientists and technicians in light of these positive factors, and should not look only at what is under our noses. Even less should we look enviously at the "money" they can make. It must be known that the money they make is obtained from labor, and that the money they make is only a small portion of the value they have created.

Admittedly, a minority of people in spare time work activities are only there for the money, that work affects their primary jobs, and they have even violated the law and committed crimes. However, this is in fact nonessential. Those who after investigation are truly criminals should be dealt with legally and punished according to the law; those who have affected their primary jobs should be reeducated. Just because a very few people have caused some problems, we should certainly not close the doors and refrain from doing necessary things in fear of the risks. There is no need for reticence. Where there are shortcomings in the particular regulations for these areas, with a positive attitude we should supplement and perfect them by earnestly summing up our experiences on the basis of actual practice. We should not analytically adopt "blocking" measures, even to the extent of labeling them as "unhealthy practices," for this would be harmful to the restructuring, to the economy, and to the development of science and technology.

Naturally, as far as the scientists and technicians taking part in spare time work activities are concerned, we want to pay attention to handling well the relations between the primary job and the spare time job. They must respect national laws and relevant policies and provisions and make their stand with even greater contributions to the state and to society, and should not think too much of what the individual has to gain or lose.

12586

CSO: 4008/2096

S&T Laws Become Necessary

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENTIOLOGY AND MANAGEMENT OF S&T]
in Chinese No 2, 1986 p 36

[Article by Yu Renbo [0060 0088 0130], Shandong Provincial Science and Technology Commission: "We Should Support Scientists and Technicians in Using Spare Time for Concurrent Positions"]

[Text] Not long ago an official of the State Science and Technology Commission pointed out on a visit to Shandong that we hope that each person can do as much as he can, as little as that may be. As long as we are willing to make the most of what we have we will provide encouragement in the form of policy. To solve this problem, we should permit and encourage concurrent jobs in spare time. In Hungary you can work as long as you have spare time, and moreover this is beneficial to the state and to the people. It shows that when you have made contributions above and beyond your regular work, what you are doing will have economic results. This is a good thing by which to enrich the country and benefit the people. Why should we not support this? We should try to make the most of the potential of people's spare time. As long as everyone on the soil of this socialist country is able to create more wealth, this is good for our state, our people, and our mission, so it ought to be permitted, supported, and encouraged.

According to statistics from the State Science and Technology Commission, among current scientists and technicians, only about 20 percent can make the most of their functions, 10 percent basically make nothing of their functions, and 60-70 percent of manual labor is done at a half load, definitely not fulfilling. Spare time jobs help make the most of the potential of scientists and technicians, they free scientists and technicians from the existing system, and give full play to the positive roles they have not yet completely fulfilled. This is just what is so urgently needed to invigorate our economy and our scientific and technical mission. Even so, there is a current strange phenomenon: in leisure time people are playing poker, chess, and fishing . . . No one is finding fault or censuring this, but when people use their spare time to take on some proper work, and go to enterprises to help with ideas and to change the backward situations there, for which they are rewarded, then everyone starts talking and this is seen as a great outrage. Even discovering or inventing something in spare time or transferring the rights to some technology, is even more considered "doing something for one's self," "not

being involved in proper work," and "only thinking about money," and similarly people cannot help but be bitterly ironic and disdainful.

It would seem that those engaged in farming and commerce can get rich first through their own outstanding efforts, and that only intellectual laborers ought to get rid of this policy. Since scientific and technical labor is also labor, and what is more is a complex intellectual labor, of even greater value created for society, so why can it not be rewarded even more? More for more labor is a socialist principle of allocation, so why is use of spare time to make contributions to the state and people actually viewed as illegal? This is surely an appearance of a remnant of "leftist" thinking.

The ways in which to make more contributions to society may be various and diverse. When scientists and technicians work in their spare time and obtain compensation for doing so, all to improve their lives and teaching and research conditions, they should do so with justice on their side. An ideal communist education is necessary, but we cannot on that basis deny the allocation for labor principle at this current socialist stage; if we were to proceed from the absolute egalitarianism of the small producers, which censures getting more from more labor, that attitude is true blasphemy of the principle of allocation according to labor, and the consequence of that can only be injury to the socialist system! Marx and Engels had already discussed this fully in the "Manifesto of the Communist Party" as something we should guard against and oppose.

Actually, the great majority of our scientists and technicians enjoy life and have no extravagant wishes, and what most concerns them is their hope that they can work more, contribute more effort, and have their own labors truly bring economic results. Therefore, questions relevant to jobs in spare time must be earnestly studied and satisfactorily resolved to guarantee that scientists and technicians will be able to fulfill their functions. One important point at present is that we want to perfect an accounting index for the primary job to scientifically determine the amounts of work. In the past, because we have been accustomed to eating from the common pot, there is no fixed amount of work, nor any way to account for it, for everything is "dependent upon conscience." Under these conditions, some leaders have been concerned that jobs in spare time would be a blow against work at the regular job, which is natural. The key is that there is no scientific accounting. Scientists and technicians have ideas on this, too. If there were a scientific and rational accounting index, actual practice has shown that jobs in spare time can accelerate and spur on advancements in management.

At the same time, setting up rules and regulations for science and technology that guarantee various matters concerned with the jobs of scientists and technicians in spare time are very important. Because those rules and regulations are currently lacking, some scientists and technicians who have made contributions and gained some income are often imprisoned mistakenly as "economic criminals." This shows that setting up and perfecting science and technology laws is already so very necessary and urgent!

Of course, in the labor of jobs in spare time we must stress that we cannot transgress the technology rights of the unit. Therefore, we should pay close

attention to what goes along with any reform and we must proceed in step so that we better eliminate obstacles that affect the development of production. And to the greatest degree should make the most of the potential of scientists and technicians to accelerate the closer integration of science and technology with the economy.

12586

CSO: 4008/2090

NATIONAL DEVELOPMENTS

SHANGHAI S&T MARKET ACTIVITY DESCRIBED

Shanghai WEN HUI BAO in Chinese 11 Mar 86 p 1

[Report by Yao Shihuang [1202 6108 3552]: "Shanghai Technology Markets Are Prosperous with Large Economic Results"]

[Text] In the year since the CPC Central Committee decided to propose the "opening up of technology markets" in regard to the restructuring of the science and technology system, technology markets in Shanghai have developed rapidly to become an important link in changing the operational system of science and technology. In 1985, the trade volume in technology markets throughout the city reached 580 million yuan, more than a fourfold increase over the previous year.

The opening of the technology markets has aroused an inner vitality for the catering to society of research units that concentrate on developmental research, it has strengthened relations between research units and production departments, and has stepped up research into difficulties of production technology. The dissemination rate for technical achievements in this country has improved from about 20 percent in 1979 to more than 60 percent at present. According to statistics for the 5,380 achievements obtained during the "Sixth 5-Year Plan," 3,747 have already been applied at an application rate of 69.5 percent. The national defense science and industry system, which in the past has had few contacts with civilian departments, has signed more than 3,800 contracts, agreements, and letters of intention, they have formed 48 production lines for major civilian products and make 57 staple commodities, for an average yearly output value of more than 1.5 billion yuan.

The economic and social results obtained after opening the technology markets have been completely obvious. After the Shanghai Petrochemical Plant and Polyester Fiber Plant obtained information on relevant energy saving technology, they took the initiative to commission the Shanghai Institute of Marine Diesel Engines to develop an exhaust gas energy recovery and electricity generation package. After this energy conservation package went into use (the first of its kind developed in this country), it generated 3.68 million kWh annually, which can increase output values by 18 million yuan.

Through the technology markets, research units have strengthened their actual and motive powers for self development, and have created the preconditions for

restructuring of the science and technology allocation system. Through various technology trade affairs, science research units have had an obvious improvement in economic income. By the end of 1985, there were already 19 local research institutes in this city that were economically independent, 12 had reached two-thirds independence, and 26 had reached one-third or more economic independence.

Invigoration of the technology markets has further aroused the enthusiasm of scientific and technical personnel. According to a 1985 sampling survey of 3,714 middle aged scientists and technicians, 25.8 percent felt that they were able to completely fulfill their function, which is double that of a 1983 survey; 7 percent felt that they could not fulfill a function, which is a two-thirds drop from 1983. With the understanding that they complete their main job first, many scientists and technicians also give full play to their "surplus enthusiasm" and actively take on after-hours consulting services, becoming an important force in invigoration of technology markets. Last year alone, the city science association sent more than 400 consulting delegations to 23 provinces and cities throughout the country, a total of more than 3,000 people.

To further solidify, perfect, and develop the technology markets in Shanghai, the municipal science and technology commission will continue to explore problems in the areas of the nature, function, modes of development, and policy of technology markets, as well as the pricing of technical commodities, at the academic conference on technology markets now being held. They will also propose and draft suggestions for relevant measures and methods regarding the perfection of the management of technology markets in order to bring about greater prosperity for the Shanghai technology markets.

12586

CSO: 4008/2091

NATIONAL DEVELOPMENTS

PATENT LITIGATION PROCESS DESCRIBED

Beijing ZHONGGUO ZHUANLI [PATENT REVIEW IN CHINA] in Chinese No 1, 1986
pp 22-24

[Article by Fei Zonghui [6316 1350 5966]: "On the Patent Litigation Process in China"]

[Text] Based on the provisions of the "Rules of Organization for the People's Court of the People's Republic of China," the People's Court system in this country includes various levels of local people's courts, special people's courts, and the supreme people's court.

There are no criminal courts, civil courts, or economic courts at any level of the local courts or at the supreme court, but they each try criminal, civil, and economic disputes and cases. The people's courts try cases through a system where the court of the second instance is the court of the last instance. When the litigant or defendant refuses to accept the first verdict or ruling from any level of the local people's court, he has the right to lodge an appeal with the next higher level of the people's courts. When a local level people's investigation court holds that the first verdict or ruling was in error, the wronged party may then contest the original verdict or ruling at the next higher people's court. The second verdict or ruling that is made by the next higher people's court is the final verdict or ruling, that is, the verdict or ruling will have taken legal effect and the litigant cannot again bring the case to court. However, if the presiding judge at any level of the people's courts discovers definite errors in what has been held to be factual or legal where a verdict or ruling of the court in question has gone into legal effect, he must submit this to the trial commission of the court in question for discussion to determine a new trial (retrial). Upon discovery of definite errors, the supreme court, in regard to verdicts or rulings that have gone into legal effect from any level of the people's courts, or a higher court, in regard to verdicts or rulings that have gone into legal effect from a lower level of the people's courts, has the authority to hear the case or to instruct a lower court to conduct a retrial.

China has not established specialty courts for the trial of trademark or patent cases. Trademark and patent disputes and cases and relevant criminal cases involving trademarks or patents are tried according to procedures provided for in the "PRC Civil Procedural Laws (provisional)" and the "PRC

Criminal Procedural Laws," respectively, in economic and criminal courts of the ordinary people's courts.

Based on provisions of the "PRC Patent Law" and "Detailed Rules and Regulations for the Implementation of Patent Law," the following seven kinds of patent disputes and cases are accepted and heard by economic courts of the people's courts: 1. a case of suit in the people's courts when an applicant for an invention patent does not accept the decision by the patent review commission in which it has turned down his request for review; 2. a case of suit in the people's courts when a dissenter or patent right holder does not accept the decision of the patent review commission in proclaiming that a patent for invention is not valid or that it upholds the rights to an invention patent; 3. a case of suit in the people's courts when a patent holder does not accept the decision by the patent office regarding implementation of compulsory compliance; 4. a case of suit in the people's courts when a patent holder does not accept the ruling of the patent office regarding the fee for use in implementation of compulsory compliance; 5. a dispute or case regarding the expenses for using an invention, a functional new model, or industrial design after application for a patent has been announced but before the patent rights have been granted; 6. a dispute or case involving violation of patent rights; 7. a dispute or case involving transfer of the application rights to a patent or a patent rights contract.

Patent cases are very specialized and international in nature, and jurisdiction is appropriately centered on a few courts. This is of advantage to ensuring unity in applicable laws, it is of advantage in summing up experiences from decisions, and it is of advantage in ensuring the quality and continuing improvement of handling cases. Proceeding from the actual conditions in this country, the supreme court has determined that jurisdiction over patent cases shall be divided as follows: 1. for all disputes and cases for which suit has been brought due to refusal to accept verdicts or rulings of the State Patent Office or the patent review commission, those disputes and cases regarding whether or not to grant invention patent rights, regarding proclamation that a conferred invention patent right is invalid or that it is upheld, or regarding patent implementation of forced compliance and the expenses for forced compliance, the Beijing Municipal central level people's court, being the location of the State Patent Office and the patent review commission, is the first court and the Beijing Municipal level people's court is the second court. 2. For disputes and cases regarding patent violations, regarding expenses for use of an invention, functional models, or industrial design after announcement of application for patent and before the patent has been granted, as well as disputes and cases regarding transfer of the rights to patent applications or contracts for patent authority, the first court is the middle level people's court in the locations of the provincial, or autonomous region, or directly controlled municipality people's governments and the middle level people's courts for each special economic zone, and the high level people's courts of the province, autonomous region, and directly controlled municipality are the second courts. Based on actual needs, the provincial and autonomous region high level people's court can instruct, with the concurrence of the supreme people's court, middle level people's courts of

open cities in the province or autonomous region in question or of large cities that have no patent management to act as the first court for trying the third type of case within districts under their jurisdiction.

In consideration of the fact that patent trials are work that is a close integration of science and technology with the law, the supreme court has already indicated that all high and middle level people's courts taking on patent trials will select, according to actual needs, a number of trial personnel with scientific backgrounds and who understand foreign languages to be responsible for work in patent trials. With an eye to the future, we must also train in a planned way a group of specialist judges to take on this work who both understand the law and also understand technology. Our patent system has just been established, and patent trials are in their initial stages. In the near term, we should also use and hire technical specialists to hold jobs as the people's jurors at trials, or to be employed as temporary or long term technical advisors to provide consultation, or to be employed as technical appraisers for solving technical problems during trials.

Foreigners, stateless people, and foreign enterprises and organizations suing, answering suits, or complying with laws and regulations in our people's courts share equal rights and duties regarding litigation with citizens and enterprise organizations of the PRC, and they may authorize one or two people to represent them in court; if they authorize a lawyer to represent the case, they must commission PRC patent lawyers. Representatives who are so commissioned must submit letters of authorization to the people's courts, and the letters of authorization must clearly state the affair authorized and the authority. If it is necessary to commission a legal representative to plead guilty on one's behalf or to not contest the suit, or for necessary litigation requests, for arbitration, for countersuits, or for appeals, then there must be special authorization. Letters of authorization sent to Chinese lawyers or Chinese citizens from foreigners or stateless people not living within the PRC, or foreign enterprises or organizations with which the PRC has not established resident representative organizations, must be certified by a notary organization of that country, and must be certified by a Chinese embassy or consulate in that country before it can be valid.

In the trial process for patent disputes or cases, the litigant has the responsibility to provide evidence on behalf of the stand he has taken, and the people's courts, too, should in a full scale and objective manner collect and investigate evidence in accordance with legal procedures. For example, in the stage of preparation before the trial comes to court, judicial personnel must diligently examine the litigation materials, including the evidence provided by both parties to the litigation, and then investigate and study it, and collect evidence. As the trial begins, judicial personnel should carry out the court investigations according to the following sequence: 1. question the parties to the litigation and statements by them; 2. question witnesses and read out the evidence of witnesses who are not at the trial; 3. question judges and read out judges' conclusions; 4. produce documents, material evidence, and what can be seen and heard; 5. read out investigator's notes. The litigants may present new evidence in court; with the court's permission, litigants may examine witnesses, judges, and investigators; they may request reappraisal, reexamination, or reinvestigation, but whether or not that is

granted is up to the people's court. At the conclusion of the court investigation, have a debate in court. When the court debate has concluded, the presiding judge will seek the final opinions from both parties, first from the plaintiff, then from the accused, and finally will reach a decision in accordance with law. The verdict announced by the court will be public throughout. When the court has announced its decision, the written judgement should be available within 10 days; judgement pronounced at a fixed time should be immediately available as written. For patent infringement disputes and cases, disputes and cases concerning expenses for use of inventions, functional new models, and industrial design after announcement of patent application but before granting of patent rights, as well as disputes and cases regarding transfer of rights to patent applications or contracts for patent rights, at each stage of the trial the people's courts ought to implement principles that emphasize mediation. On the basis of clarifying facts and distinguishing right and wrong, they should urge litigants to understand one another and to reach an agreement. Judgments should be timely when mediation is not effective.

When proclaiming that conferred patent rights are invalid, first of all the patent review commission should undertake an investigation so that during the process of litigation over patent infringement, when a defendant countersues for invalidation of patent rights, the people's court hearing the patent infringement case should notify the defendant in accordance with the provisions of patent law and should apply to the patent review commission for a review. If still refusing to accept the review decision, the complainant may begin litigation in the middle people's court of Beijing Municipality. During this time, the people's court hearing the patent infringement litigation may stop the litigation and wait until the problem of whether the patent rights are valid or not has been decided before returning to the patent litigation.

In patent infringement litigation, the people's courts may instruct the defendant to stop patent infringement behavior based on application by the plaintiff or according to a ruling by authorities for the preservation of the litigation, and may as well adopt the litigation preservation measures of sealing up, distraining, freezing, and requiring provision of security. When the people's court decides to adopt litigation preservation measures and instructs the defendant to stop patent violation behavior, it may, due to necessity, instruct the plaintiff to provide security, and if he refuses to do so may reject the application. When the applicant has sued in vain, he should compensate the defendant for the loss of property caused by litigation security. Of course, the people's court will be very circumspect in its adoption of litigation security. They will not be easily used unless the facts regarding violation are very clear, the situation is very urgent, or the plaintiff has provided irrefutable evidence and there is every assurance he will win the case.

Patent law in this country provides that the effective period for litigation by which to seek damage compensation for patent violation is 2 years, beginning from the day the patent holder or person of common interest knew or should have known of the patent violation. If the review decision produced by the patent review commission or the ruling of the patent office is not

accepted, any litigation must be initiated at a people's court within 3 months of the day of notification. Initiating litigation after this period will not be heard by the court.

Based on the provisions of our patent law, counterfeiting another person's patent is a serious situation that constitutes a crime, and not only will he assume the responsibility for compensation of violations, but according to Article 127 in our penal code, for the crime of counterfeiting another person's patent, those directly responsible will be imprisoned for no more than 3 years, or have forced labor, or be fined. If patent office personnel collude in fraudulent practices with relevant personnel in concerned countries, that is a serious situation, and according to the provisions of Article 188 in the penal code, for bending the law for the benefit of relatives or friends, the penalty is no more than 5 years of imprisonment, or forced labor, or loss of political rights; where the circumstances are particularly serious, imprisonment may be for more than 5 years.

The patent laws of this country went into effect on 1 April of this year [1985]. Forecasting on the basis of patent applications, there will be constant occurrences of the kinds of patent disputes discussed above, and especially disputes about authentic rights to patents, disputes about violations of patents, and disputes about patent contracts. It might be that a department would constitute litigation, requiring resolution by the people's courts. The people's courts of this country will continue to accumulate experience through judicial practice, which will aid in even better executing patent law. They will protect the patent rights to inventions and creations, which will accelerate the development of science and technology.

12586

CSO: 4008/2094

NATIONAL DEVELOPMENTS

IMPORTANCE OF PATENT LAW IN TECHNOLOGY COMPETITION DISCUSSED

Beijing ZHONGGUO ZHUANLI [PATENT REVIEW IN CHINA] in Chinese No 2, 1986 p 6

[Article by Wang Wenjiang [3769 2429 3068]: "Patents and Technology Competition Among Enterprises"]

[Text] Over the last few years, use of the means of patent law protection has become more and more important in technology competition among enterprises. Therefore, many countries in the world are actively exploring patent strategies. We have just begun the patent process in China, and this is a new subject for study as we accelerate the technical advancement of enterprises. This paper presents some unformed opinions on this subject.

With the rapid development of modern science and technology, in competition among enterprises capital factors and material resource factors steadily fall into secondary positions, while factors of technology are raised to decisive positions. Because of this, for countries that implement a patent system an enterprise must formulate an accurate patent strategy in order to seek its existence and development and to safeguard its advantages in fierce technology competition. The enterprise must use the means of patent law to ensure the development of the enterprise's new technology and new products.

That this country has implemented a patent system has provided objective beneficial conditions for technical advances in enterprises for it provides legal protection for new technology and new products. Because of this, as enterprises formulate plans for production and operations and determine topics for technology development, they must undertake comprehensive analysis and study along the lines of patent management to provide a basis for enterprise development.

In international technology competition, enterprises are either putting out technology or are bringing it in, and this is much related to the patent strategy they have formulated, for if the patent strategy they have selected is not correct, this will not be of use to the development of the enterprise. Therefore, when studying the relations between enterprise technology competition and patents, we must not disregard the efforts of patent strategy selection.

At the development and research stage for new technology, the focus of patent strategies is in providing effective patent technology information to provide a basis for new technology development. At the production and sales stages, the core of patent strategy is the protection and maintenance of patent rights. There is an intimate relation between patent strategies and enterprise operations strategies and development strategies. According to Japanese statistics, the majority of enterprises obtaining patents are developmental enterprises that emphasize technology development.

The patent strategy system may be divided into three portions: 1. information, that is, the circulation and utilization of patent information and patent knowledge; 2. law, that is, use of the patent system and the obtaining, protection, and exercise of patent rights; 3. technology, that is, the development of new technology and the use and shifting of new technologies.

Patent information is the heart of the information aspects of patent strategies. Through control of patent information, not only can the circumstances of patent ownership of other enterprises be understood, but the trends in the development of new technology can also be known. Just by studying the proportion of patent ownership of an enterprise, one can know in large part the technical power of this enterprise. By reading patent publications, one can also discover product development directions with the greatest future.

The focus in legal aspects of patent strategies is on the obtaining of invention rights. Making use of "opportunistic strategies," some enterprises, through analysis of the situation for technology competition have mastered the standards and directions for technology development among competitors. Only when they see that technology competitors are about to catch up do they apply for patent rights. When selecting a patent strategy, factors that should also be considered are what degree of threat it would be if other enterprises obtain that technology or invention. When the threat is great, then adopt a strategy whereby a large portion is public, but where key technologies are not public, which will be secret tricks of the trade. This is the strategy often used by foreign enterprises in technology competition.

The focus of patent strategies in the aspect of technology is to actively use patent information for forecasting of trends in technology development. Because of the steady specialization, integration, and complexity of modern technology, the majority with the greatest futures are in the newest fields of technology. Whether or not new technologies for enterprise development will be used by the enterprise in question will be determined by circumstance, and the standard for evaluation is the principle of obtaining the greatest benefit. Sometimes, this is only used by this enterprise for technical monopoly; sometimes it is for sale at a high price to obtain the highest profits; sometimes it is to obtain a mutual transfer of rights, exchanging for technology needed by the enterprise in question.

As science and technology continue to develop, the degree of technology intensiveness for our export products will gradually be raised, and if we wish to maintain competitive advantages we must use the means of patent law. If exported technology can be patented, then we must certainly apply for patents

and protect patents first, and then export that technology. This way, when technology is exported, advanced technology will not be copied. Therefore, in technology competition among enterprises patent management is important work. Abroad, patent management departments are the highest staff departments in the enterprise and are directly led by the highest decision making personnel in the enterprise. Medium and large enterprises not only have specialists in charge of patent work, but also have corresponding patent management structures, i.e., patent departments or patent sections. The functions of these patent personnel are to be responsible for patent applications for the technologies and inventions of the enterprise in question, to provide an advantageous environment and conditions for inventing and creating; handling the affairs concerning patent rights; developing a licensing trade; providing a patent information service; and promoting technical, inventive, and creative activities for the staff of the enterprise.

In summary, there is an intimate relation between patent strategies and enterprise technology competition, and using the means of patent law to safeguard enterprise technology competition is an important task.

12586

CSO: 4008/2094

NATIONAL DEVELOPMENTS

ASPECTS OF MILITARY SUPPORT OF CIVILIAN GOODS PRODUCTION ANALYZED

Beijing HANGKONG ZHIZAO GONGCHENG [AVIATION PRODUCTION ENGINEERING] in Chinese No 9, 1 Sep 85 pp 28-29

[Article by Cheng Lianjun [4453 3353 8823]: "Investigating the New Regime of 'Meeting Military Quotas While Transferring Technology to Civilian Goods Production'"]

[Text] At this year's conference of aviation industry enterprise and service management personnel, Minister Mo Wenxiang [5459 2429 4382] announced the requirement that the aviation industry must adapt itself to the overall situation in national construction, transferring technology to civilian goods production while assuring the fulfillment of military quotas, and make the transfer on a large scale, rapidly and comprehensively. This is a major step in further implementing the policy of linking military and civilian production, combining production for peace and war, giving military goods priority and having civilian production nourish military production. Some views, dealing only with how the national defense industry should make the changeover to transferring technology to civilian production while assuring military production quotas, are put forward; corrections are welcome.

I. Liberate Thinking, Raise Consciousness, Intensify Awareness of the Importance of Assuring Military Production Quotas While Transferring Technology to Civilian Goods Production

In recent years the aviation industry has made great progress in implementing the policy of linking military and civilian production and making a major effort in civilian goods, and the results have been gratifying. But complete unity in understanding the policy of linking military and civilian production has not been achieved, thinking has not been sufficiently liberated, and a deeper understanding of the new situation is needed. Comrade Deng Xiaoping has stated that in addition to carrying out the armaments and equipment research and production tasks specified by the State Council and the Central Military Commission, all elements of the national defense industry must devote themselves fully to civilian goods research and production. Premier Zhao Ziyang recently stated that "converting military industrial technology to civilian uses is extremely important." In other words, the entire national defense industry is faced with two major tasks, namely promoting the modernization of national defense and at the same time promoting the

development of the national economy. This policy is in accord with China's national situation, as outlined in detail below.

A. It is suited to the needs of national economic development. As modernization is pursued on all fronts, and as the economic policies of opening to other countries and stimulating domestic development are thoroughly implemented, both key state projects and the technical modernization of existing enterprises urgently require large amounts of technically advanced, top-quality equipment and technical assistance. In addition, as the people's material and cultural standard of living is raised, there is an increasing need for attractive, inexpensive, high-quality goods. The national defense industry has the best equipment in the country, a full range of research and production facilities, and abundant technical capabilities; if they are incorporated into the unified plan for national economic development, they can be a mainstay of vigorous economic development.

B. It springs from the characteristics of production in the military industries. For the last 30-odd years, under extremely arduous financial and material conditions, China has nonetheless expended considerable effort to give the national defense industry the production and research capabilities to deal with a "sudden outbreak of war." It is now possible that the forces maintaining peace throughout the world will make further progress and that there will be no large world war for a long period, so that we should concentrate our efforts on economic development; this has made it necessary for the national defense industry to direct its surplus capabilities, beyond those involved in research on and production of military products, to civilian uses, integrating military production with civilian production, and supporting the development of the national economy.

C. It is urgently needed in order to increase the national defense industry's capability for self-renovation and self-development and to strengthen its qualities. The reorganization of the economic system that is currently under way requires that the enterprises genuinely develop into relatively independent economic bodies and become autonomously managed socialist producers and operators with responsibility for their own profits and losses and with the ability for self-renovation and self-development. This reform, which centers on strengthening enterprise vitality, is also entirely suited to the national defense industry. In this new situation, while submitting to the state plan and state management, the national defense industry must do everything possible to expand into more product markets and technology markets, to satisfy complex and ever-changing social needs, and at the same time to acquire the funds needed for self-renovation and self-development; in the process of servicing civilian needs and transferring technology to civilian uses, it must copy the strong points of the civilian industries and train scientific and technical personnel.

Only by unifying their thinking, overcoming the fear of difficulty and the preoccupation with temporary measures, making up their minds to engage in civilian production over the long term, and engaging in comprehensive planning, will it be possible to implement fully the policy of transferring technology to civilian production while meeting military quotas.

II. Improve Organization, Establish a Management System To Coordinate Military and Civilian Production

Organizational measures are an urgent requirement for instituting the new regime of technology transfer to civilian production while meeting military quotas. Implementation of this policy goes hand in hand with the current "redirection and revamping" of enterprise management. At present, while the military industrial enterprises' conceptions of management, markets, competition, production startups, and finance have not been finalized and the production management model has not entirely taken shape, this will unavoidably increase the difficulty of instituting the new regime.

A. In macroscopic economic management, the central, province and municipality economic management bodies must incorporate military industrial capabilities under their jurisdiction into the economic development plans at the various levels, establish ties between higher and lower levels, and create a management system for linking military and civilian production that has a certain amount of authority. Recently some provinces and municipalities have organized "coordinating committees," "liaison committees," or various types of technical services companies to act as go-betweens and to establish contacts between higher and lower levels in order to tie the relevant bodies together into an organic whole; this is clearly beneficial as a transitional measure.

B. While working vigorously to improve social organization, military industrial enterprises and their cognizant departments (including companies, bases, management offices and ministries) must make realistic efforts to strengthen leadership, improve organization, and create mutually compatible management bodies for integrating military and civilian production. In general, the following five functional systems must gradually be developed:

1. a market information collection, market forecasting and plan coordination system to provide data for correct management decisionmaking;
2. a civilian products development system to modernize and upgrade products continuously and to maintain strong market vitality;
3. a civilian products production system that uses rational adjustment and allocation of production capabilities to adapt to requirements for production of civilian goods in lots of specific sizes;
4. establishment of a multilevel, multichannel civilian goods marketing network and technical services system, which is a key link in developing civilian goods production;
5. a scientific and technical consulting service system to promote the transfer of military industrial technology to civilian industries and to make thorough use of the excellent technical capabilities of military industrial enterprises.

If these five systems join with social organizations to develop vertical administrative systems and trans-department, trans-industry horizontal

interconnections into matrix organization structures and cooperative network systems, and if an appropriate operational management system is then drafted, it will be possible to implement the civilian technology transfer policy effectively.

III. Rational Policymaking, Effective Choice of Civilian Products and Forms of Technology Transfer

In the present new situation, transfer of technology to civilian production while meeting military quotas has two implications. One is that the military industries' production capabilities are to be used in an energetic effort to organize civilian production by directly furnishing products to equip and renovate civilian industry and to satisfy social consumption requirements in order to make up for deficiencies in the production capabilities and technological levels of local civilian industry. The second is that military industrial technology is to be transferred to civilian industry and economic and technical cooperation between military and civilian production are to be developed in order to improve the technical standards of civilian industries and to promote technical progress. To achieve genuine results in these two areas, great emphasis must be placed on management policymaking, the key factor in which is the choice of methods for choosing civilian products and forms of technology transfer.

A. Choice of Civilian Products

Correct choice of civilian goods to produce is critical to the success of military-civilian production coordination. In choosing civilian products, the following principles should be strictly adhered to.

1. First, every effort must be made to develop combined military-civilian usability, technological compatibility, similarity of production processes, and similar design. This will allow thorough utilization of existing production capabilities, expand the size of production lines, shorten the research and development cycle, decrease product costs and reap good economic benefits.

2. The path must be cleared for civilian products rather than "competing for food" with them, and every effort must be made to develop technology-intensive product designs. On the one hand it is possible to focus on equipment urgently needed for technical renovation of civilian industry and on products in short supply which it is difficult for most civilian industries to make, but for which society has an urgent need and which have good development prospects; on the other hand the long view must be taken, and emphasis must be placed on utilizing the technical strong points of military industrial enterprises and choosing "high-quality, high-precision, sophisticated" high-technology products of complicated design that are extremely technology-intensive. This not only will promote market competitiveness, but will also help to raise the technical level of military production.

To implement this policy, it will be necessary to conduct detailed market research, with a particular focus on undeveloped markets; the main effort must be devoted to identifying undeveloped market potential. This potential

is rather great in China, and the military industrial enterprises can bring their technological superiority fully to bear in this area.

3. Attention must be devoted to selecting products suited to diversified, multichannel joint production, either local or on a multilocality, multiindustry basis, or even joint production that breaks through the boundaries between different ownership systems. Most military industrial enterprises have rather strong integrated assembly and adjustment and testing capabilities, so that models that are not entirely technology-intensive may be selected when environmental analysis indicates the possibility of organizing dispersed processing and joint production of parts and components with relatively low technological requirements that can be processed in rather large quantities. This allows rapid adaptation to changes in product design, allows the size of production lots to be increased, and makes it possible to take full advantage of the strengths of both military industrial enterprises and civilian enterprises.

4. Effective feasibility studies must be made when choosing civilian products, together with technological and economic evaluation, in order to assure that the return will be greater than the investment and that good economic benefits will be obtained. Naturally, in the process of technical and economic evaluation, the principle of equal emphasis on enterprise economic benefits and economic benefits to society must be adhered to.

B. Choice of Types of Technology Transfer

The following forms of transfer of military technology to civilian industries currently exist.

1. Transfer of development results. This means compensated transfer of mature product development results, manufacturing processes, metallurgy, computer software and other research results to civilian enterprises and the expansion of their applications in order to promote the technical progress of civilian producers.

2. Joint military-civilian task forces. In this method, either personnel are sent to participate in key high-yield technology projects dealing with long-standing or new weak links in production by civilian enterprises, or manufacturing, installation, adjustment and testing tasks are taken on as joint task force efforts so as to bring about technology transfer in the course of problem solving.

3. Joint production and joint product development. In this method, certain key products are chosen, economic and technical cooperation with civilian enterprises is organized, and joint production or joint research is carried on.

4. Suitable opening up of military industrial units' advanced equipment, special processing technologies, or experimental, testing, measurement, computation and other material and technical facilities to serve civilian industry; in addition, core technical groups or various types of specialized personnel can be trained for civilian industry.

5. Technical consultation services. This method makes use of the military industrial enterprises' abundance of technical personnel and knowledge-intensive character via participation in various consulting organizations, acceptance of large amounts of consulting tasks and problem solving for civilian industries, and information sharing and provision of data. This is the most common and flexible form of technology transfer.

6. Entry into economic zones and coastal open-door cities. Coastal open-door zones are windows looking both inward and outward, and by virtue of their strong points, military industrial enterprises are fully able to play a greater role there, to combine the transfer of technology to civilian industries with the assimilation of imported technologies, and to engage in domestic and foreign trade in which industrial or technical activity is combined with trade.

To summarize, selection of civilian products and choice of forms of technology transfer are major policy problems in the course of transferring technology to civilian production. All types of technical and economic evaluations should be carried out, using extensive investigation, scientific analysis and calculations, and while assuring correct decisionmaking, no time should be lost in organizing and carrying out these activities thoroughly and successfully. It must be realized that as the situation develops, on the one hand society's requirements are expanding and the various industries' needs for technological progress are becoming increasingly pressing, while on the other hand market competition is becoming increasingly fierce. Therefore we must always assure that products are of high quality, incorporate new technologies, are inexpensive to produce, have a short development cycle and win a good reputation, and we must strive to unify the concerns of speed, benefits, standards and investment in order to promote economic and technical cooperation between military and civilian industry and to implement the strategic policy of transferring technology to civilian industry while meeting military quotas.

8480

CSO: 4008/23

NATIONAL DEVELOPMENTS

NATIONAL CHEMICAL CONFERENCE ENDS IN BEIJING

OW300313 Beijing Domestic Service in Mandarin 1100 GMT 29 Apr 86

[Text] The National Conference on Chemical Work, which ended today in Beijing, emphatically pointed out: To fulfill the basic tasks of the chemical industry during the Seventh 5-Year Plan, we must vigorously promote five spirits: The pioneering spirit of the foolish old man who removed the mountain, the spirit of boldly making innovations, the spirit of plain living and hard work, the spirit of extensive socialist cooperation, and the spirit of workers being the masters of their own affairs.

The conference pointed out: To achieve the goals set for the chemical industry during the Seventh 5-Year Plan, the most important thing is to bring into play our subjective initiative, press forward in the face of difficulties and overcome them, and tap the potential of existing enterprises.

The conference pointed out: Man must have some revolutionary spirit. With this spirit, we will be able to march forward courageously and overcome all kinds of difficulties. We relied on this spirit to establish and develop our country's chemical industry. Under the current situation of reform, opening to the outside world, and stimulating the economy, we should be even more vigorous in keeping up this spirit.

The conference emphatically pointed out: In recent years, the chemical industrial departments have given less attention to these spirits and the people's sense of them has been blunted. Now we must give wide publicity to the five spirits from the higher levels to the grass-roots and make new contributions to fulfilling the goals for the chemical industry during the Seventh 5-Year Plan and to rejuvenating the chemical industry.

/12858
CSO: 4008/1061

NATIONAL DEVELOPMENTS

SCIENTIFIC RESEARCH AWARDS CEREMONY

OW151044 Beijing XINHUA in English 0958 GMT 15 May 86

[Text] Beijing, 15 May (XINHUA)—Scientists, technicians and inventors who have made major contributions to national economic, social or defense development were presented with trophies, medals and certificates at a meeting here today.

Party and state leaders Zhao Ziyang, Wan Li, Xi Zhongxun, Fang Yi, Li Peng, Yang Shangkun and Hu Qili were among 7,000 people who attended the prize-giving ceremony in the Great Hall of the People.

It was the second such prize-giving since a national scientific meeting was held in 1978.

National awards for promoting scientific and technological advances were presented for 1,761 scientific research achievements in such fields as nuclear physics, rocket technology, medicine, machine-building, electronics, chemicals, metallurgy, energy, textiles, agriculture, forestry, water conservancy, communications and transport.

Premier Zhao Ziyang extended congratulations on behalf of the communist party Central Committee and the State Council to the prizewinners, and said they had all made important contributions to national development.

He said the achievements had resulted from determined efforts by the scientists based on the results of research by their predecessors and with the help of many ordinary workers.

National awards for inventions were presented for another 185 items, including the "Mianyang Number 11" high-protein, high-yield wheat strain, and a highly-successful method of replanting severed limbs. Forty of these also won international awards.

In addition, 3,896 achievements were commended nationally for the promotion of science and technology during the Sixth 5-Year Plan (1981-1985).

Also attending today's meeting were representatives of winners of 42 medals at international invention fairs in Geneva and Yugoslavia earlier this year, and of winners of 4 gold medals at a world youth invention achievement exhibition in Bulgaria last year.

NATIONAL DEVELOPMENTS

APPLICATION OF S&T RESEARCH RESULTS DISCUSSED

Beijing GUANGMING RIBAO in Chinese 23 Mar 86 p 1

[Report by Yang Zhonglian [2799 6988 3425]: "Science and Technology Must Pay Attention to Applications and Spur Development"]

[Text] We read some news in the newspaper: in the research field of fuzzy mathematics, China was some 10 years behind some of the advanced countries of the world, but through urgent and direct efforts we have become one of the four strongest contingents in this area, abreast of the United States, Japan, and some European countries. It turns out that at the same time that fuzzy mathematics researchers in this country have been engaged in theoretical research, they have joined with specialists and scholars in real applications to make fuzzy mathematics a part of the natural sciences and even part of many applications fields of the social sciences. This has consequently allowed this discipline to flourish in China. As this fact so strongly demonstrates, paying attention to applications and spurring development is the correct path toward invigorating science and technology activity in this country.

From the viewpoint of the theory of dialectical materialism, when people discover, invent, and create things empirically in science and technology, that is certainly through a leap in cognition, while applying these discoveries, inventions, and creations to transforming the world is an even more important leap in cognition. In the actual process of applying science and technology to the transformation of the world, there are new advances, and consequently to an even greater degree and even broader context it enriches mankind. Obviously, applications are the final goal of science and technology, and are also the starting point through which science and technology gain new advances. In this demand to pay attention to applications and spur on development, the key is paying attention to applications. We say that science and technology are production forces, by which we mean production forces that are direct transformations of science and technology through dissemination of applications.

In the past few years, applications and developments of science and technology in this country have taken a good turn toward prosperity. New advances in China's satellite communications engineering are an obvious indication. If the rocket technology for launching synchronous satellites had not been applied, then in 1984 we could not have put our experimental communications satellite into a geosynchronous space orbit. Also, only because of the

practice gained through the launch and testing of the experimental communications satellite, when Chinese workers in space and electronics technologies deepened their understanding of synchronous communications satellites, could they successfully launch this year the functional communications broadcast satellite that was more precise in position and had better functions. However, we should also see that we have many scientific and technical achievements that have not been well disseminated or applied. Only about half the number of applications research achievements of certain science research organizations that could be sold have been.

Looking for reasons, they might be: the research achievements do not suit objective needs, or they might be too expensive to turn into products. This then requires that when organizing the work of science and technology we fully understand the needs of the marketplace, that we better provide "marketable" technical achievements, and also that we improve the functions of achievements through the creative efforts of scientists and technicians. Another reason is in the area of ideological awareness. Some comrades always feel that technology and equipment are all right for foreigners, where it is clear that we have things in this country and yet we do not hesitate to spend foreign exchange to buy them abroad. For these reasons it is necessary to provide through legislation that in situations where functionality and price are more or less equal, preference will be given to adopting domestic scientific and technical achievements while limiting imports. Otherwise, we cannot safeguard the development of our science and technology through application. Naturally, we will still enable our scientific and technical achievements to attract domestic customers through market competition and capture international markets.

Paying attention to applications also includes "pick-upism" and applying the advanced foreign scientific and technical achievements that we lack. Regarding the problem of how to "pick up," we once traveled a circuitous path. More clearly, to just pick up foreign eggs and directly consume them cannot be done, and to pick up the foreign hen (including foreign chickenfeed) and bring it here to lay and raise the eggs is also not a good policy. What we ought to do is to import the advanced technology from other countries, assimilate it, and make it our own. Beginning in the 1960's, Japan spent 80 percent of the capital it used for importing on software and buying patents. They were very strict about buying ready-made equipment, and expenses for assimilating and absorbing imported technology were many times that of the expenses for importing technology itself. Science and technology in Japan after the war to a very great degree used this kind of "pick up" method to directly catch up to the United States and Europe. We can learn from this experience.

Paying attention to applications promotes development, and definitely does not mean that through application all science and technology will naturally develop. Here, the word "promote" is all important. Scientific and technical workers must develop their own independence through actual practice before it will be possible to surpass the accomplishments of those who came before and to have new discoveries and gain new applications. Science and technology management departments will also have to exert more effort on behalf of the word "promote" to arouse the enthusiasm of scientists and technicians through correct policies.

To stress attention to applications and promotion of development in no way means that we should neglect basic research. A country as large as ours needs, without doubt, to have a corresponding group of outstanding scientists and technicians to engage in exploratory work never before attempted, but speaking from the needs of China's economic construction, the focus of basic science research should still be subjects with a future in applications. This is especially true for research projects faced with the characteristics of our natural conditions and natural resources, about which there is also no doubt.

12586

CSO: 4008/2096

NATIONAL DEVELOPMENTS

SCIENTIFIC EXPLORATION TEAM TO EXPLORE CHANG JIANG

OW201440 Beijing XINHUA in English 1408 GMT 20 May 86

[Text] Beijing, 20 May (XINHUA)—A scientific exploration team is to sail down the Chang Jiang, China's longest, beginning at the end of June or the beginning of July.

The river is 6,300 km long, with a drop of 5,400 meters. If the team succeeds in the exploration, it will break the world record made by a Japanese who had sailed the 6,000 km Amazon with a drop of 3,200 meters, said the overseas edition of today's PEOPLE'S DAILY.

The 6-month exploration will be jointly sponsored by the Chengdu Institute of Geography of the Chinese Academy of Sciences, the Sichuan Provincial Commission of Physical Culture and Sports, and the Sichuan Provincial Society of Geography.

The daily said the 30 team members—averaging 25 years in age—were selected among 300 applicants from all over China.

It quoted deputy team leader Tang Bangxing as saying that they were now receiving training "somewhere in Sichuan Province."

Tang is a mud-rock-flow expert and deputy director of the Chengdu Institute of Geography.

The first attempt at sailing the length of the Chang Jiang was made by 34-year-old Chinese photographer Yao Maoshu last year. Yao died while trying to navigate the part of the river in northwest China's Qinghai Province.

"We are determined to conquer the river with team work," Tang said.

/12232

CSO: 4010/2017

NATIONAL DEVELOPMENTS

SCHOLASTIC ACTIVITIES AT CHINA UNIVERSITY OF S&T DESCRIBED

Hefei ANHUI RIBAO in Chinese 26 Feb 86 p 1

[Report by Zhu Guanghua [2612 0342 5478]: "The Scholastic Atmosphere is Dense: Talent is Coming Out in Large Numbers and There is a Great Show of Abilities"]

[Text] The China University of Science and Technology has diligently implemented the Party's "double hundred" principle, and the scholastic atmosphere is pronounced. Here, all schools of thought can be developed, and all kinds of talent can make itself known, and the entire campus is full of life and energy.

Here, announcements for various scholastic reports can be seen every day, those in charge enjoy reputations as scholars throughout China, and there are also students and graduate students of the particular disciplines who are "just taking their first steps." Whether or not your qualifications are extensive or slight, whether or not you have a title, as long as you have a unique worthwhile solution, you will be heard. Here, various different schools of thought can both "occupy the stage at the same time" and can also "contend for attention in the same room," for everyone will accept the strengths and compensate for the weaknesses, there is constant innovation, and relations are extremely harmonious. The astrophysics center of this school has maintained freedom of course selection since its inception in 1973, as well as freedom of organization, and the principle of free discussion, with a 2-hour conference every Friday. Among the members of this center there are different views regarding the question of the form of the dimensional structure of the universe, but they continue to explore together, exchange notes with each other, so that all levels have been greatly improved. In recent years, more than 200 papers have been published in scholastic journals both domestic and foreign, and the center was awarded first and third prizes by the 1985 International Gravitation Society for papers. Only one of the original five members of the center was a lecturer, while now they have developed to the point of having 14 members, among which 5 are full or associate professors, 3 are PhD's, 2 are diligently pursuing their doctorates, 4 are lecturers, and they have become a fresh new force in the field of astrophysics research that has attracted attention both foreign and domestic.

The Chinese University of Science and Technology is a stage for the young to show their abilities, and the school has allowed young and middle aged people

be the first line "selection bridge" in teaching, research, and management. The great majority of the school's primary lecturers, those in charge of research topics, heads of teaching and research sections and of laboratories, and heads of sections, offices, and departments are all young and middle aged. The school encourages young people to strive for the front ranks of science and technology. Last year, at the all-China engineering thermophysics annual meeting, 9 people from the school were invited to attend, 6 among whom had just graduated or were still graduate students, and 13 papers were read at the conference, which attracted the attention of those in the same field. In recent years, the school has had an open policy and has sent more than 600 young and middle aged teachers and students abroad for advanced studies, of whom more than 200 have already returned to offer more than 100 new courses. In recent evaluations of academic positions, this school, whether in funds or personnel, has maintained standards and stressed contributions, and the evaluation of the committee to check academic ranks was: among lecturers 45 years of age and younger, 6 were promoted to be professors and 47 to be associate professors; another 7 young teachers under 40 were promoted to associate professor. Chen Lin [7115 7207], only 40, of the biology department was promoted ahead of his field to full professor because of his outstanding achievements in science and technology, for which he was awarded a first place prize by the Academy of Sciences for major scientific and technical achievements.

After this school began to be led by a group of specialists and scholars, great care was taken to guard against the tendency for "like professions to repress each other," and to give full play to the role of the great body of teachers in managing studies and running the school. Six school leaders have implemented a division of work and assignment of responsibility to individuals for sections, offices, and departments. They will often look into lower levels, will understand the situation, and it has been ruled that every Saturday afternoon is a "school director reception day." The school director and deputy directors will take turns in meeting with teachers and students who come and in handling the problems they raise. They also regularly hear inquiries from anyone, as for example in one half-day meeting where school director Guan Weiyan [4619 1919 3508] went to the platform seven times to respond to everyone's questions.

12586

CSO: 4008/2091

NATIONAL DEVELOPMENTS

JIAOTONG UNIVERSITY'S SUPPORT OF LOCAL ECONOMY DISCUSSED

Xian SHAANXI RIBAO in Chinese 11 Mar 86 p 3

[Report by Zhang Guangqiang [1728 0342 1730] and Gu Pinliang [7357 0756 5328]:
"Xian's Jiaotong University Makes Outstanding Record for Invigorating the
Shaanxi Economy"]

[Text] In invigorating economic construction in Shaanxi, the Xian Jiaotong University has had an outstanding record. Since the 3d Plenary Session of the 11th CPC Central Committee, this school has obtained 403 scientific and technical achievements, 68 of which have reached or approached international standards and 311 of which filled domestic gaps or reached advanced domestic standards. According to incomplete statistics, industrial technology achievements already disseminated and applied have created economic results for the state of nearly 500 million yuan.

Xian's Jiaotong University has used the benefits of its own talent and the characteristics of its varied curriculum to enthusiastically develop scientific and technical cooperation with enterprises affiliated with Shaanxi Province and with Xian at the same time as it has enthusiastically taken on major national tasking. At present, this school has set up cooperative relations with 144 industrial enterprises in this province, and has signed up for 320 scientific and technical cooperative projects concerned with technology transfer, transfer of rights to achievements, importation and assimilation, new product development, commissioned development, and joint problem solving. They are helping to develop new products for some technically backward collectives and small factories with unsalable products using enthusiastic technical and talent support. They have helped the Xian Radio Factory No 14, the Xian Atmospheric Boiler Factory, the Xian Fuse Plant, and the Tongchuan Abrasion Materials Plant develop new products, allowing these enterprises which perennially lost money and which were on the verge of closing their doors to regain vitality.

They have also developed four national level high quality name brand products for some of the industrial enterprises in this province; they have directly transferred the rights to 36 scientific and technical achievements. They have helped a group of established enterprises accomplish 120 projects in technology transformation, have helped more than 50 professors and associate professors gain positions as technical consultants with some enterprises, and have helped train more than 1,200 technical personnel for relevant factories and mines.

NATIONAL DEVELOPMENTS

BRIEFS

QINGHAI MONOPOLIZES SILICON MARKET--The Qinghai Province trade group is monopolizing the silicon market at the Guangzhou Spring Commodities Fair. All the silicon products of the whole country are being handled by the Qinghai group. There is a constant stream of foreign businessmen making inquiries at the group's reception office. (Shen Qikang), deputy manager of the provincial Metallic Minerals Import and Export Company, says that Qinghai has formed a silicon-producing combine to develop production of ferrosilicon and alloys. This will play a stimulating role in invigorating the province's economy. [Text] [Xining Qinghai Provincial Service in Mandarin 2330 GMT 17 Apr 86 HK] /12858

CSO: 4008/1061

PHYSICAL SCIENCES

HOLOGRAPHIC STUDY OF VIBRATION OF UNDERWATER SOUND TRANSDUCER

Qingdao SHANDONG HAIYANG XUEYUAN XUEBAO [JOURNAL OF SHANDONG COLLEGE OF OCEANOLOGY] in Chinese Vol 51 No 4, 15 Dec 85 pp 17-22

[Article by Liu Jilu [0491 4949 7120], Lu Deming [6424 1795 2494], and Li Xuan [2621 5503]]

[Text] I. Introduction

The method of interferometry used in laser holography is a new, high-precision measurement technique which has been widely used in science and technology. The continuous-exposure holographic method (or the time average method) is very effective in analyzing vibrating objects. This method provides high accuracy and is not constrained by the material or shape of the test article because it does not make mechanical contact with the test article. Today, oceanic development is becoming increasingly more important, and underwater sound transducer is an important device used in oceanic exploration, underwater engineering, off-shore petroleum exploration and production, shipping, and military engineering. The development of ocean science also imposes higher technical requirements on underwater sound transducer. Therefore, the study of high-efficiency, high-sensitivity transducers has become an important research topic for developing the oceanic industry. This article describes a method of using holographic methods to record the vibration patterns of the widely used piezoelectric transducer in order to study its vibration modes, amplitudes, and amplitude-phase distributions. This result provides useful experimental and theoretical data for the development, production, and testing of underwater sound transducers.

II. Basic Principle

In making holographic recordings of an object which is in simple harmonic motion, if the exposure time is much longer than the vibration period of the object, and when the reflected light from the object and the reference light on the holographic plate are coherent, then assuming that the recording and processing are both linear, the intensity of the object light after recurrence is:

$$I \propto \frac{|A_0|^2}{T} \left| \int_0^T \exp(iKYZ \cos \omega t) dt \right|^2 \quad (1)$$

where ω is the circular frequency of vibration, Z is the amplitude, γ is a function of the subtended angle between incident and reflected light, $K = 2\pi/\lambda$, λ is the wavelength of the incident light.

By letting $n = 0$ in the expression for Bessel function

$$J_n(x) = \frac{i^{-n}}{2\pi} \int_0^{2\pi} \exp(jx \cos \theta) \exp(in\theta) d\theta$$

equation (1) can be reduced to:

$$I \propto |A_s|^2 J_0^2(K\gamma Z) \quad (2)$$

If α is the angle between the incident light and the direction of motion of the object, i.e., the normal line to the reflecting surface, and β is the angle between the direction of observation and the normal line, then $\gamma = \cos \alpha + \cos \beta$. The above equation can be rewritten as

$$I \propto I_0 J_0^2(\varphi) \quad (3)$$

where

$$\varphi = \frac{2\pi}{\lambda} Z (\cos \alpha + \cos \beta) \quad (4)$$

and I_0 is the light intensity corresponding to a stationary object, or a vibration node. The Bessel function can be computed using the following series expansion

$$J_n(x) = \sum_{k=0}^{\infty} \frac{(-1)^k}{K!(K+n)!} \left(\frac{x}{2}\right)^{2K+n} \quad (5)$$

The interference pattern on the recurrent holograph primarily reflects the position of deformation of the vibrating object. α and β can be determined from experiments. The value $\varphi = 0$, for which $J_0(\varphi) = 1$ and $I = I_0$ corresponds to the positions of zeroth-order bright fringes, or zero displacement. Thus, the vibration-free region, or the vibration nodes are indicated by the brightest spots in the vibration pattern. The series of values of φ for which $J_0(\varphi) = 0$ and $I = 0$ correspond to the dark fringes. Other values of ω for which $J_0(\varphi)$ again reach maximum correspond to the bright fringes of different orders. Therefore, equation (3) represents the bright and dark fringes observed after recurrence of holographic interference on a sinusoidal vibrating surface; they correspond to the positions on the vibrating surface with different amplitudes. Thus, the position shape of the fringe pattern on a holograph directly reflects the vibration condition of the radiating surface of an underwater sound transducer. By studying these fringe patterns and calculating the vibration amplitudes Z and amplitude distribution from equations (3) and (4), one can perform qualitative and quantitative analyses of the vibration characteristics and important parameters of the transducer.

III. Experimental Procedure

The holographic experiment was carried out on a shockproof optical table; its optical circuit is shown in Figure 1. In this figure, L is a He-Ne laser, t is an optical switch (1-100 second exposure time), s is a beam splitter, M_1 , M_2 are reflecting mirrors, L_1 , L_2 are beam broadening lenses, p is a continuous light-reducing plate, T is the underwater sound transducer, and H is the holographic plate. The difference in optical paths between the object light and the reference light is less than 2 cm; the intensity ratio between the object light and the reference light is approximately $I_0:I_r = 1:1.5$. The subtended angle between the object beam and the reference beam is $\theta = 20^\circ$ to 30° .

The excitation circuit of the underwater sound transducer is shown in Figure 2.

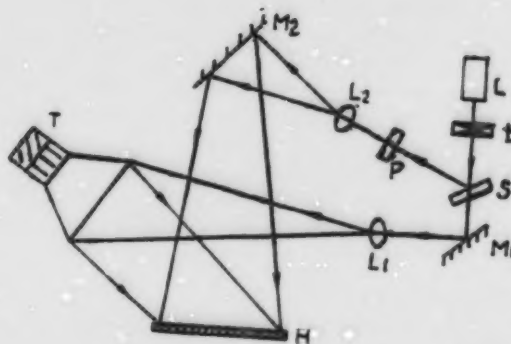


Figure 1. Optical Circuit for Holography

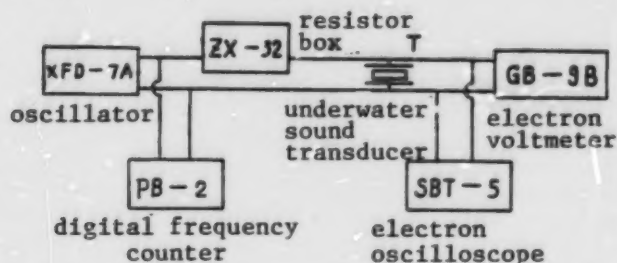


Figure 2. Block Diagram for the Excitation Circuit of the Underwater Sound Transducer

In this figure, T is a composite piezoelectric transducer whose drive element is PZT-4. The transducer is rigidly clamped to the table. The transducer, the oscillator, and the resistor are connected in series, and the operating voltage is measured by an electron voltmeter; the minimum voltage reading

indicates the resonance point. The frequency of the excitation voltage can be read accurately using a digital frequency counter, and the waveform is displayed on the oscilloscope.

IV. Results

The time average holographic pictures of the vibration modes of the radiating surface of an underwater sound transducer are shown on the next page. There are two types of radiation cover plates: a 78 mm cylindrical plate and a 98 mm circular plate. The drive elements are all PZT-4, 20 mm in diameter, and 5 mm thick.

Plate A shows a picture of the composite piezoelectric transducer where the radiating surface is stationary.

Plate B shows a picture of the radiating surface with a cylindrical cover plate; the operating frequency is $f_B = 25304$ Hz, the excitation voltage of the oscillator is $V_1 = 40$ v, the operating voltage of the transducer is $V_2 = 20$ v, and the operating point is at the fundamental resonance frequency. The vibration pattern is uni-modal, and the nodal curve is a circle.

Plate C shows a cylindrical cover plate. $f_C = 25980$ Hz, $V_1 = 10$ v, $V_2 = 3.8$ v, and the operating point is at the fundamental resonance frequency. The vibration pattern is uni-modal, and the nodal curve is a circle.

Plate D shows a circular cover plate. $f_D = 27113$ Hz, $V_1 = 50$ v, $V_2 = 44$ v, and the operating point is at the fundamental resonance frequency. The vibration pattern is uni-modal, and the nodal curve is a circle.

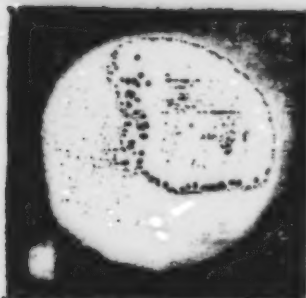
Plate E shows a cylindrical cover plate. $f_E = 52329$ Hz, which is at the second harmonic, $V_1 = 53$ v, $V_2 = 22$ v. The vibration pattern is uni-modal and the nodal curve is a circle.

Plate F shows a circular cover plate. $f_F = 46802$ Hz, which is smaller than the second harmonic, $V_1 = 58$ v, $V_2 = 56$ v. The vibration pattern is a bi-modal, symmetric pattern.

Plate G shows a circular cover plate. $f_G = 46952$ Hz, which is smaller than the second harmonic, $V_1 = 57$ v, $V_2 = 54$ v. The vibration pattern is a quadri-modal, symmetric pattern.

Plate H shows a circular cover plate. $f_H = 91688$ Hz, which is smaller than the fourth harmonic. $V_1 = 55$ v, $V_2 = 53$ v. The vibration pattern is a multi-modal, symmetric pattern.

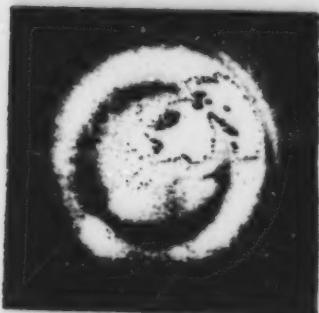
The amplitude distribution curves along the radial direction of the radiating surface calculated from equation (4) for the uni-modal cases are shown in Figure 3.



A. Radiating surface of the transducer is stationary



B. Cylindrical plate
 $f = 25304 \text{ Hz}$; $V_1 = 40 \text{ V}$; $V_2 = 20 \text{ V}$



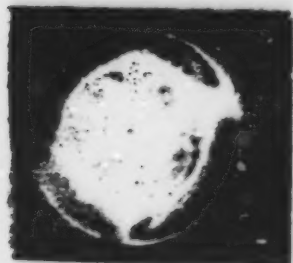
C. Cylindrical plate
 $f = 26980 \text{ Hz}$;
 $V_1 = 10 \text{ V}$; $V_2 = 3.8 \text{ V}$



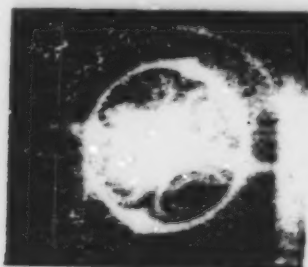
D. Circular plate
 $f = 27113 \text{ Hz}$;
 $V_1 = 50 \text{ V}$; $V_2 = 44 \text{ V}$



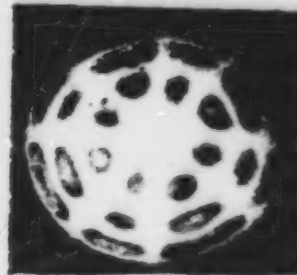
E. Cylindrical plate
 $f = 52329 \text{ Hz}$;
 $V_1 = 50 \text{ V}$; $V_2 = 22 \text{ V}$



F. Circular plate
 $f = 46802 \text{ Hz}$;
 $V_1 = 55 \text{ V}$; $V_2 = 56 \text{ V}$

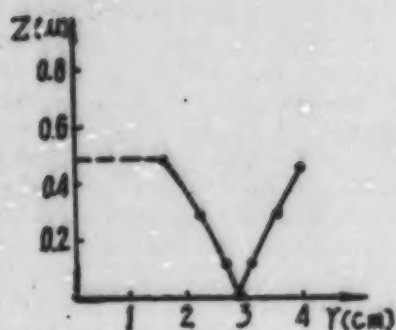


G. Circular plate
 $f = 46952 \text{ Hz}$;
 $V_1 = 57 \text{ V}$; $V_2 = 54 \text{ V}$

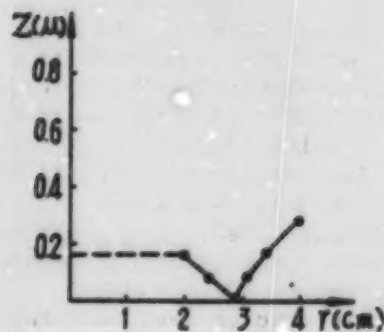


H. Circular plate
 $f = 91688 \text{ Hz}$;
 $V_1 = 55 \text{ V}$; $V_2 = 55 \text{ V}$

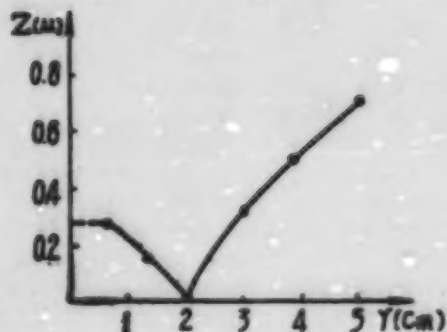
Pictures of Vibration Modes of the Underwater Sound Transducer



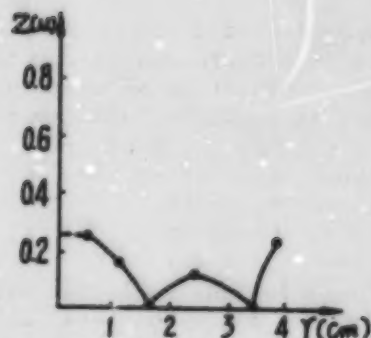
(1) Curve B



(2) Curve C



(3) Curve D



(4) Curve E

Figure 3. Amplitude Distribution Curves of the Radiating Surfaces of Underwater Sound Transducers

V. Discussion

1. The vibration modes of the radiating surface of the transducer can be observed directly from the holograph. The vibration modes of the same transducer are different for different operating frequencies and excitation voltages. It can be seen from plates B, C, and the corresponding amplitude distribution curves in Figure 3 (1) and (2) that when a transducer is operating at the fundamental frequency, the amplitude increases with increasing operating voltage (within a certain range); the higher the operating voltage, the denser the fringe pattern, and the larger the amplitudes. At this point the emission efficiency of the transducer is high.

2. The center of the brightest region on the holograph corresponds to $J_0^2(\varphi) = 1$, or $\varphi = 0$; since the amplitude is $z = \frac{\lambda \varphi}{2\pi(\cos\alpha + \cos\beta)}$ it corresponds to the zero-amplitude nodal curve. For a transducer operating at the

fundamental frequency, the nodal curve is a circle, as shown in plates B, C, and D. At the second harmonic or higher frequencies, plates F, G, and H show that the vibration-free region (i.e., the nodal curve becomes a complicated symmetric pattern, and the amplitude distributions are also more complex (multiple modes). In this case, small changes in frequency or excitation voltage will cause large variations in the vibration modes (see plates F and G). The radiating surface becomes divided into several small regions, with the region of maximum amplitude reduced and the amplitudes diminished. Hence the performance of the transducer is degraded.

3. It can also be seen from the holograph that there may be two fringes on the same picture with equal brightness (see plate E), and the relative brightness remains unchanged when varying the recurrence angle. In this case the radiating surface has two nodal curves, hence the amplitudes of the corresponding points on the radiating surface are reduced (see Figure 3(4)), and the performance of the transducer is also degraded.

4. Since the radiation cover plate and the drive element are rigidly attached by prestressed bolts, the central sections between the radiating surface and the drive element have approximately equal amplitudes. This is reflected as a bright, uniform region on the holograph.

Holographic study shows that the vibration pattern of the radiating surface and the number, shape, and distribution of nodal curves depend on the shape, dimensions, operating frequency, and excitation voltage of the transducer. In transducer design, when the shape and dimensions are specified, the vibration modes and amplitude distributions of the radiating surface can be studied by using the laser holography time average method to provide important data on such parameters as directivity, radiated power, and receiving sensitivity.

The authors would like to express their thanks to Comrade Yu Suolong of Bureau 715 for valuable discussions during the course of this work.

3012/9365
CSO: 4008/1056

APPLIED SCIENCES

PROPULSION ENGINEERING RESEARCH DESCRIBED

Beijing GUOJI HANGKONG [INTERNATIONAL AVIATION] in Chinese No 11, Nov 85
pp 32-33, 31

[Article by Aircraft Engines Department, Nanjing Aeronautical Institute: "A Brief Introduction to Propulsion Engineering Research at Nanjing Aeronautical Institute"]

[Text] In order to improve the technical characteristics of aircraft, their power plants must have excellent performance characteristics, such as high thrust, high efficiency, and long life. New progress must therefore be made in power plant research: on the one hand we must focus on improving the performance of all assemblies and their mutual compatibility, while on the other hand we must achieve integrated power system control. Thus the scope of work must be expanded and its subject matter must be extended into several adjoining or overlapping areas of science.

In recent years the Aircraft Engines Department of Nanjing Aeronautical Institute has conducted a series of theoretical and experimental studies related to the above two points and has achieved new progress, particularly in such areas as intake duct flow, combustion stability and flow field analysis, high-temperature turbine blade cooling techniques, impeller flow, strength and vibration of structures, system control, and microcomputer control, and has produced some quite respectable results.

Intake Duct Flow Research

In order for the compressor to achieve the desired intake flow field states under all working conditions, full studies must be made of flow and flow-field conditions inside the intake duct. Our intake duct research laboratory was established in the 1970's, and it has conducted a series of investigations related to improving intake flow field quality in the last 10-odd years. First, we used simulation boards to conduct experimental studies on the stability characteristics of intake duct flow fields, which yielded excellent results and provided effective modeling techniques for matching power plants to aircraft. Next we studied the use of eddy generators (vane type and air turbines) on boundary layers, providing useful design methods for improving intake flow field characteristics. We also did a great deal of research on the unstable flow mechanisms resulting from the interaction between shock

waves and boundary layers. The Royal Aircraft Establishment (RAE) of the United Kingdom wrote a report on our research results in this area, and we are now further developing this research on turbulence generation mechanism and applications. In addition, we have conducted various flow fields studies on subsonic diffusers, providing reliable data for diffuser design. We have made excellent progress in flow-field calculations and experimental studies of viscous compressible fully turbulent flow and vortical flow, which have won respect both at home and abroad. The Rolls Royce Company (U.K.) has used certain of our data as standards for its measurement of intake capabilities.

Research on Impeller Flow

In order to achieve the optimum relationship between compressor efficiency, geometrical characteristics and weight, we undertook research on the "tandem cascade" design; gratifying progress has already been achieved in research related to the selection of geometrical characteristics of tandem cascade blades and their relationship to flow characteristics, providing useful figures and information on tandem cascade design. We made calculations on two-dimensional flow field characteristics of viscous large-angle impeller channels and proposed that the solution method for viscous flow equations on a curved surface be extended to three dimensions. In nonconstant flow, we conducted research on the mechanisms of axial transfer of intake distortion and the effect of geometric characteristics on distortion and made an analytical study of the applicability of compressor surge/rotary speed loss criteria in real engineering problems. This work advanced research on operating characteristics of the entire compressor and on compressor matching.

Research on Combustion Stability Characteristics and Flow Fields

In order to assure correct, reliable afterburner starting under a variety of working conditions and stable, high-efficiency operation, we have carried out numerous research studies on ignition techniques and combustion stability, as well as return-flow zone flow fields. The results of research on catalyzed ignition and on evaporation-type stabilizers were as advanced as their foreign counterparts. Research on precombustion-type stabilizers was also carried out. These stabilizers have already demonstrated in certain bench tests that they have considerable potential for decreasing fuel consumption and increasing combustion efficiency; recent flying tests have yielded new results in decreasing fuel consumption and increasing reliability. In the flow-field calculations for the return-flow zone in both the cold and hot states, we provided computational formulas for the flow field in the return-flow zone behind various types of flame stabilizers in the cold state, a method of calculating the corresponding field in the hot state that uses a simple combustion model, and a method for calculating the expansion angle of a wide-angle flame. We solved the problem of calculating the combustion products of hydrocarbons at chemical equilibrium and their thermodynamic characteristics, obtaining useful data.

Research on Cooling Techniques for High-Temperature Turbine Blades

Since the middle 1970's we have carried out a series of studies on cooling techniques for high-temperature turbine blades, including basic research on

modeling pulsed cooling of turbine blades, pulsed cooling with multiple rows of round jet holes, local pulsed heat exchange characteristics with round jet holes along the inside of a half-cylinder with and without a gas film, and combined pulse and film cooling, which have yielded some gratifying progress. Some results are already beginning to be used in engine design modifications. At the Seventh International Heat Transfer Conference (IHTC) we presented a paper entitled "Experimental Study of the Effect of Single- and Triple-Row Jets on Pulsed Heat Exchange Characteristics of a Half-Cylindrical Cavity," which was well received by the conference participants. We are now preparing for thorough basic research into certain new cooling methods.

Structural Strength and Vibration Research

To determine the fatigue life of turbine blades under certain actual loading conditions, we used the YZD-2 automatic fatigue test control device, designed by us, to automate turbine blade fatigue tests with constant-amplitude fixed-frequency tracking. This not only improved the accuracy of experimental results, but also decreased the time and physical effort required of experimental personnel. We are currently writing the relevant computer software on the basis of actual flying load spectra in order to carry out laboratory experiments on cumulative blade fatigue dynamics under controlled load conditions, which will yield P-S-N characteristics and fatigue lifetimes under actual load conditions. In addition, we have conducted research on the use of blade simulation experiments to determine true P-S-N characteristics. Progress has also been made in using acceleration fatigue theory for rapid estimation of blade lifetimes and the remaining lifetime of old blades.

Because stressed housings are subjected to complex forces, there are certain difficulties in their structural design. In order to solve this problem, we conducted studies of the strength and rigidity of stressed housings under complex loading. We used theoretical computations and experiments to determine the stress distribution on housings and investigated the heat and stress fields and the high-temperature creep and low-cycle fatigue lifetime prediction of perforated rectangular boards under one-directional pulsed tensile loads, obtaining rather good results.

To solve the problem of the matching of rotor bearing and rotor characteristics, we used the subsystem impedance analysis method to study the matching of dynamic characteristics between rotors and elastically damped bearings; we proposed the use of the "transfer matrix-impedance coupling" method to analyze the dynamic characteristics of rotor systems and established the characteristic relationship between the rotor subsystem's critical speed and bearing impedance.

In recent engines, blade vibration characteristics are greatly influenced by disk rigidity and damping; importance should therefore be attached to studying coupled disk vibration. We used an advanced finite-element technique to develop a set of computational methods and formulas applicable to the intrinsic characteristics of disk assemblies and proposed modal experiment principles and testing methods; we used the multipoint induced vibration technique and the hammer blow technique to measure the vibrational characteristics of disk assemblies. We carried out tests and measurements on

a certain compressor disk assembly, obtaining satisfying results. By analyzing typical components, we gained a preliminary understanding of the laws of coupled vibration of disks, providing data for decreasing disk vibration and for troubleshooting.

Research on Power Plant Control Technology

Power plant performance is strongly dependent on control system characteristics. The application of control theory, the choice of a control approach, the choice of control methods and the characteristics of control components all have a major effect on control techniques. Modern control theory, electronics technology and microcomputer technology, as well as hydraulic and pneumatic transmission technology, must be combined and applied to control systems in order to improve their technical characteristics. In recent years we have conducted research on the applications of optimal control theory in aeronautical power plant control; by setting up numerical models of the controlled systems we have obtained "formula packages" suited to optimal control, which we have used to study deterministic and random optimal control under various circumstances; we have also achieved maximum-speed control of digital computer-stepping motor systems and have achieved time optimum and carried out $u^*(t)$ control, as well as combining electromechanical stepping systems and regulators into semiphysical models for bench-type modeling experiments, which have yielded a body of experimental data.

In the field of helicopter turboshaft engines we studied numerical models of single, double and triple speed [fa 4099] transmission systems, and the results are already being used in calculating the characteristics of certain helicopters. In order to investigate the mechanisms of qixin [3086 1800] pump impeller flow fields and methods of performing calculations on them, we carried out experimental studies and theoretical calculations with a pump test bench that we fabricated, obtaining some helpful results which will help in further research and design calculations on these pumps.

Areas of Expanded Research

In order to make full use of the academy's scientific and technical capabilities in support of economic development, in recent years we have gradually developed new research topics related to civilian blowers and pumps, comprehensive utilization and conservation of thermal power, measurement and automation of thermodynamic processes, combustion of heavy oil and coal powder, and the applications of microcomputers in production and experimentation; some of these products are already yielding preliminary results.

8480

CSO: 4008/26

AIRFOIL DESIGN AT SONIC VELOCITY

Mianyang KONGQIDONGLIXUE XUEBAO [ACTA AERODYNAMICA SINICA] in Chinese Vol 4 No 1, Mar 86 pp 1-10

[English abstract of article by Ling Baoyu [0407 1405 3768] of Nanchang Aircraft Company]

[Text] A numerical finite difference method for calculating a hodograph solution at free-stream Mach number 1 is described in this paper. The exact hodograph formulation is used in the calculation.

Because of the singularity of the far field boundary condition in the physical plane, which is mapped to a singular point on the hodograph plane, the approximate analytical solution of the Tricomi equation is employed in the paper.

The boundary curves of five examples for the numerical calculation in the hodograph plane are described by the spline method. A family of airfoil shapes and their pressure distribution, drag, lift and moment about the leading edge are presented. These sonic airfoil designs may be useful in assessing the near sonic aircraft performance.

REFERENCES

1. Chaplygin, S.A., "On Gas Jet," SCI. ANNALS IMP. UNIV. OF MOSCOW, PHY-MATH. Div. 21, Moscow, 1904.
2. Karman, V., "The Compressibility Effects in Aerodynamics," J. AERO. SCI., Vol. 8, pp 337-356.
3. Garabedian, B.F., Korn, P.D., Jameson, A., "Supercritical Wing Sections II," Spring-Verlag, New York, 1975.
4. Niewland, G.Y., "Transonic Potential Flow Around a Family of Quasi-Elliptical Airfoil Sections," NLR, 1967.
5. Guderley, K.G., "Singularities at Sonic Velocity," Tech. Report F-TR-1171-ND, Headquarter Air Material Command, Wright Patterson Air Force Base, Dayton, Ohio.
6. Guderley, K.G., Yoshihara, H., "The Flow Over a Wedge Profile at Mach Number 1," J. AERO. SCI., Vol 17, 1950, pp 723-735.
7. Ferrari, C., Tricomi, F.G., "Transonic Aerodynamics," Academic Press, New York, 1968.
8. Germain, P., "Ecoulements Transsoniques Homogenes," PROGRESS IN AERONAUTICAL SCIENCES, Vol 5, Pergamon Press, 1964.

NUMERICAL MODELING OF COMBUSTOR RECIRCULATION FLOWFIELD

Mianyang KONGQIDONGLIXUE XUEBAO [ACTA AERODYNAMICA SINICA] in Chinese Vol 4 No 1, Mar 86 pp 31-36

[English abstract of article by Zhao Lie [6932 3525] of the Institute of Mechanics, Chinese Academy of Sciences]

[Text] The present study is concerned with a fluid dynamic research task of interest to the combustor designer. A number of different types of recirculation regions are observed in combustors. In this paper, numerical computations have been undertaken for variant recirculation flowfields.

The purpose of this paper is to investigate the flowfields around the bluff-body flame stabilizer and the conditions under which the parallel jets in the same direction generate centerline recirculation.

A universal program which is suitable for simulating many configurations of combustors is formulated. One of the characteristics is a stair-step boundary representation of the stabilizer sidewall. Primitive variables of pressure and velocity are used. Turbulence simulation is by way of a two-equation k-E model.

Computational results show the interesting effects of combustor design parameters. Available experimental data provide confirmatory comparisons. The universality of the program is further confirmed.

REFERENCES

1. Patankar, S.V., "Numerical Heat Transfer and Fluid Flow," Hemisphere-McGraw-Hill, New York, 1980.
2. Fujii, S., Gomi, M., Eguchi, K., ASME J. FLUIDS ENGINEERING, Vol 100, 1978, p 323.
3. Novick, A.S., et al., J. ENERGY, Vol 3, No 2, 1979, p 95.

THE CALCULATION OF VERTICAL CONSTANT-SPEED WATER ENTRY CAVITY OF FLAT-NOSED BODY USING MAC-METHOD

Mianyang KONGQIDONGLIXUE XUEBAO [ACTA AERODYNAMICA SINICA] in Chinese Vol 4 No 1, Mar 86 pp 47-55

[English abstract of article by Chen Jiuxi [7115 0046 6932] and Yan Kai [7346 7030] of China Ship Scientific Research Center]

[Text] This paper attempts to simulate numerically the complete process of the development of the water-entry cavity using the MAC-method. The Navier-Stokes equation is solved by means of the finite difference method and the water surface and cavity shape are determined by the so-called marker particles, making it unnecessary to assume the cavity shape a priori. The kinematic and dynamic conditions on free surfaces are satisfied easily. The development process of the cavity, including separation, open cavity phase, deep closure and jets after closure, is shown in figures. The pressure distribution and drag coefficient are also included.

AN IMPROVEMENT OF THE NUMERICAL METHOD FOR CALCULATING AIRCRAFT CONFIGURATION
LONGITUDINAL AERODYNAMIC CHARACTERISTICS

Mianyang KONGQIDONGLIXUE XUEBAO [ACTA AERODYNAMICA SINICA] in Chinese Vol 4
No 1, Mar 86 pp 56-64

[English abstract of article by Jiang Zhenglu [5592 2973 4389] of the China
Aerodynamic Research and Development Center]

[Text] Based on the subsonic and supersonic potential theory, an improved numerical method is developed for calculating the surface pressure distribution on the aircraft and then the force and moment by integrating the pressure distributions, using surface distribution finite elementary solutions. With the joint flow field and effective section thrust concepts and the strip turbulent boundary layer theory, an improved drag calculation can be obtained. A computer program has been developed. Several examples of calculated aerodynamic characteristics are presented and good agreement between calculation results and experiment data can be achieved.

CALCULATION OF TRANSONIC VISCOUS FLOWS OVER AN ARBITRARY AIRFOIL

Mianyang KONGQIDONGLIXUE XUEBAO [ACTA AERODYNAMICA SINICA] in Chinese Vol 4
No 1, Mar 86 pp 81-87

[English abstract of article by Zhang Huiliu [1728 1979 6448] of Nanjing
Aeronautical Institute]

[Text] A new method for computing the inviscid-viscous interaction of
transonic flows is presented.

The potential flow is computed by using the conservative full potential
equations and a fast algorithm. The flow field around the airfoil is trans-
formed into the inside of the unit circle by conformal mapping in which the
FFT technique is used. The boundary layer equations are solved by using the
C-S box method which has high accuracy and stability. The turbulence flow
is described by a simple vortex-eddy model.

The calculation procedure of inviscid-viscous interaction of transonic flow
is as follows: the potential flow is computed using the method stated above.
At the same time, the velocity distribution on the surface of the airfoil
is gained, which is the outer edge velocity for computing the boundary layer.
Then the boundary layer equations are solved and the distribution of the
displaced thickness is obtained. This procedure is repeated until the
algorithm is convergent.

Two transonic flow fields are calculated using this method. The agreement
between calculated and experimental results is quite good. We predict that
this method will be applied to practical designs.

INVESTIGATING SIMILARITY IN TURBULENT JETS BY LDA

Miayang KONGQIDONGLIXUE XUEBAO [ACTA AERODYNAMICA SINICA] in Chinese Vol 4
No 1, Mar 86 pp 108-115

[English abstract of article by Jiang Zhengxing [1203 2973 5887] and Lin
Qixun [2651 0366 0530] of Northwestern Polytechnical University]

[Text] In this paper, a proof of the existence of the similarity in simple round and coaxial jets is given not only for nondimensional mean velocity, but also for turbulence. The similarity of simple or coaxial turbulent jets is of importance to the semi-empirical integral calculation and in theoretical or numerical computation concerning complex turbulent jets, and to the choice of the corresponding turbulent model and initial conditions. The above-mentioned proof is based on experimental investigation and analysis of mean velocity and turbulent profiles in simple round or coaxial free jets and these profiles were all obtained from DISA 55X two-dimensional Laser Doppler Anemometry (LDA).

We have arrived at the following conclusions:

1. LDA can be used to investigate the similarity of isobaric compressible and incompressible jets. In supersonic jets with shock waves, it is difficult to measure the flow field immediately following the shock wave due to the restriction of the instruments.
2. For isobaric incompressible jets, both the distribution of the mean velocity and the root mean square of turbulence can be similar if they were conducted according to the rule proposed in the paper.
3. The similarity curve of mean velocity and the root mean square of turbulence are insensitive to the thickness of nozzle lips and the Re number.

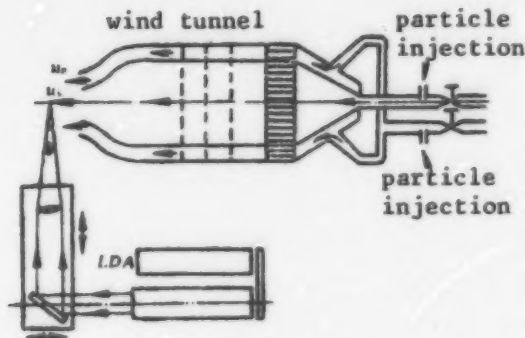


Fig. 1. Experimental Set-up

9717

CSO: 4009/62

Computers

MANAGEMENT PROBLEMS IN SOFTWARE TESTING

Chongqing JISUANJI KEXUE [COMPUTER SCIENCE] in Chinese No 4, 23 Aug 85 pp 51-54

[Article by Zhou Zhiying [0719 0037 5391] and Liu Aiwu [0491 1947 2976] of Department of Computer Sciences, Qinghua University]

[Abstract] As presented in the paper, software testing management is an important factor affecting test persistent time and test cost. By referring to the statistical number in executing the MSST software system, the paper describes its effects on testing by management, thus detailing the importance and avenues for improvement in managing software testing. In the authors' view, testing methods should be studied in order to prescribe test standards and an acceptable level of test management quality. In addition, testing tools are needed to help in implementing means of management. The MSST is composed of four independent programs: command interpretative routine TDBC of the test data library, management program TDBD of the test data library, program EXEC for module operation control and report form output, and program TDG for test data output. A table shows 11,000 statements in 226 modules for these 4 programs. Altogether 7 months of testing were involved; the statistics in the paper pertain to the last 3 months, including both testing and debugging. Four other tables list data of repeated testing (and statistics) in the last 3 months, the user situation of part of the test data, and preparation of a drive program for module testing.

IMPLEMENTATION OF FACILITIES FOR MODULARIZED LANGUAGE PROCEDURE

Chongqing JISUANJI KEXUE [COMPUTER SCIENCE] in Chinese No 4, 23 Aug 85 pp 55-59

[Article by Zhang Xinger [1728 1630 0348], Nanjing University]

[Abstract] Currently, modularization is a developmental trend in program language design. The paper presents the XCY-2, an improved version of XCY, language. Due to limitations of the traditional implementation language, a method for implementing the procedure utility of modularization language is presented. New problems in implementation can be solved. In addition, by introducing the concept of the psuedo-index register for direct transmission of graphic and real parameters, not requiring an intermediate transitional data zone in the traditional implementation method, simplicity and high effectiveness can follow thereby saving internal storage space. Compilation includes features of correct, strict checking on the correlation of graphic and real parameters. The approach for direct transmission of graphic and real parameters by introducing a pseudo-index register is apparently adaptable to the ordinary nonmodularization language and various simpler situations. Three figures show the compilation of procedure statements, transmission of graphic and real parameters, and the relationship between the procedure data vector and designation attribute nomenclature. The author is grateful to Professor Xu Jiafu [1776 1367 4395] for his revision.

10424/9365
CSO: 4009/1040

NEW TYPE OF RESONATOR—SPHERICAL RESONANT CAVITY, BASIC CHARACTERISTICS

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 6 No 2, Feb 86
pp 97-103

[English abstract of article by Qian Shixiong [6929 1102 7160] of the Department
of Physics, Fudan University, Shanghai]

[Text] This paper presents a new type of resonator—a spherical resonant cavity, which consists of a spheric medium and its interface with the surrounding medium. The intrinsic modes, mode frequencies and the internal field of this spherical cavity are discussed. It is pointed out that this kind of cavity can be used as a good optical resonator. Finally, the spectrum and angular distribution of elastic scattering from the spherical droplet are given.

SOME OPERATING CHARACTERISTICS OF COLLIDING PULSE MODE-LOCKED Nd:YAG LASER

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 6 No 2, Feb 86 pp 104-109

[English abstract of article by Sheng Guoping [4141 0948 1627], et al., of Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences]

[Text] We have conducted detailed experimental studies of a colliding pulse mode-locked Nd:YAG laser. The operating characteristics of the laser under different conditions of position, thickness, concentration of saturable absorber and pumping energy are given. Mode-locked light pulses with duration of 11~12 ps can routinely be obtained from this laser.

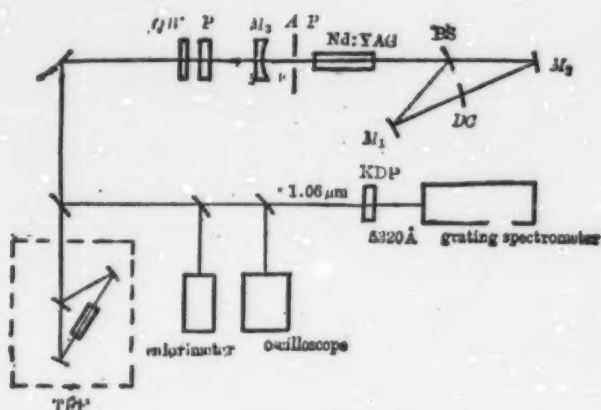


Fig. 1 Experimental set-up

ACTIVE MODE-LOCKED Cu VAPOR LASER

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 6 No 2, Feb 86
pp 110-113

[English abstract of article by Zhang Guiyan [1728 2710 3601], Tang Jinrong [3282 6855 2837] and Lin Fucheng [2651 4395 2052] of Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences]

[Text] A acousto-optic modulator is used for active mode-locking in a discharge-heated CuCl laser. The modulation depth of 100 percent and the pulse-width of 2 ns are obtained. The laser repetition frequency is 16 kHz and the probability of mode-locking is about 100 percent.



Fig. 1 Schematic of the laser cavity

DESIGN METHOD FOR VARIABLE-WIGGLER FEL WITH GRADIENT AXIAL MAGNETIC FIELD

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 6 No 2, Feb 86
pp 114-121

[English abstract of article by Chen Jianwen [7115 1696 2429] of Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences]

[Text] The analytic expression for the bunching potential was derived according to Lorentz equations and the requirement that the force be equal to the minus gradient of the potential. The energy transfer between a relativistic electron and the radiation field is equivalent to the electron energy variation in this space potential well, and the maximum energy lost by the electron in this potential well is proportional to the depth of the well. In order to increase the energy transfer efficiency, it is required that the potential well be as deep as possible and, at the same time, the electron be kept synchronous with the potential well. These are the principles for designing FEL. The calculation results showed:

(1) The axial magnetic field should decrease exponentially along the electron propagation direction, i.e., $B_{//}(z) = B_{//}(0)\exp(-Kz)$, where

$K = \frac{|e|\hbar}{\gamma_0 mc} A_w K_w r_0^2$; m , e and c are electron static mass, electron charge and light velocity respectively; γ_0 is a relativistic parameter; A_w and K_w are wiggler amplitude and wave number, respectively; and γ_0 is the average electron Larmor radius.

(2) In contrast to the axial magnetic field, the wiggler field should increase, i.e.

$$A_w(z) = \lambda \frac{[\lambda + A_w(0)]e^{2\lambda_0 z} - [\lambda - A_w(0)]}{[\lambda + A_w(0)]e^{2\lambda_0 z} + [\lambda - A_w(0)]},$$

where:

$$\lambda = \frac{|e|\hbar}{\gamma_0 mc} K_w^2 r_0, \quad \lambda_0 = [r_0 B_{//}(0)]^2 + [A_w(0)]^2.$$

When the conditions mentioned above are satisfied, the FEL can operate better.

DOUBLE FILTERING FOR MAPPING PHASE OBJECTS

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 6 No 2, Feb 86
pp 122-128

[English abstract of article by Liu Liren [0491 4539 0086] of Shanghai
Institute of Optics and Fine Mechanics, Chinese Academy of Sciences]

[Text] A new method, double filtering with two filter masks, is proposed to perform the Fourier-transform quasi-interferometry. In this way, some complex filter functions can be synthesized in a Moire equivalence from two comparatively simple filter functions. Furthermore, the resultant filter function can be continuously changed by moving the masks along the optical axis, thus producing remarkable flexibility in practical applications.

STUDY OF $(F_2^+)^*$ CENTERS IN $NaF:Mg^{2+}$ CRYSTALS

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 6 No 2, Feb 86
pp 149-154

[English abstract of article by Yu Yizhong [0060 1942 0112], et al., of the
Department of Physics, Tianjin University; and Li Hao [2621 3185] of the
Technical Physics Research Institute, Tianjin]

[Text] An experimental study of $(F_2^+)^*$ centers in $NaF:Mg^{2+}$ crystals is reported in this paper. The process of type transfer from F_2^+ to $(F_2^+)^*$ centers was observed in our experiment. The rate of transfer depends on the type of doped divalent metal ions rather than the concentration of doped cations. It was also found that the products of thermal bleaching of the $(F_2^+)^*$ center exhibit the same properties as those of Z_4 centers. Based on the results of the experiments, we propose a possible model in which the $(F_2^+)^*$ center is formed by connecting a F_2^+ center to an I-V pair.

ENERGY LEVELS AND SPECTROSCOPIC CHARACTERISTICS OF Cr^{3+} in $\text{Y}_3\text{Ga}_5\text{O}_{12}$ CRYSTAL*

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 6 No 2, Feb 86
pp 155-161

[English abstract of article by Tang Honggao [3282 3183 7559], et al., of
Anhui Institute of Optics and Fine Mechanics, Chinese Academy of Sciences]

[Text] The energy levels and spectroscopic characteristics of the $\text{Y}_3\text{Ga}_5\text{O}_{12}:\text{Cr}^{3+}$ crystal grown by the flux method are reported. At room temperature the effective fluorescence lifetime of $^4\text{T}_2$ and ^2E levels was measured to be 205 μs with the central wavelength of the fluorescence spectrum being 727 nm. The crystal-field energy levels were calculated according to the Tanabe-Sugano theory. The crystal field strength parameter D_q , racah parameters B and C, and parameter Δ were calculated to be 1626, 645, 2950 and 538 cm^{-1} , respectively.

* Project supported by the Science Fund of the Chinese Academy of Sciences.

CS₂ MULTIPHOTON IONIZATION MASS SPECTRA INDUCED BY XeCl LASER

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 6 No 2, Feb 86
pp 162-168

[English abstract of article by Guan Yifu [7070 0001 1133], et al., of Anhui
Institute of Optics and Fine Mechanics, Chinese Academy of Sciences]

[Text] CS₂ multiphoton ionization (MPI) mass spectra induced by a XeCl laser
are reported. The dependence of ion intensity on laser intensity and sample
pressure is measured. Based on the experimental results and some calculations,
the MPI model of CS₂ and the forming pathways of ions are described.

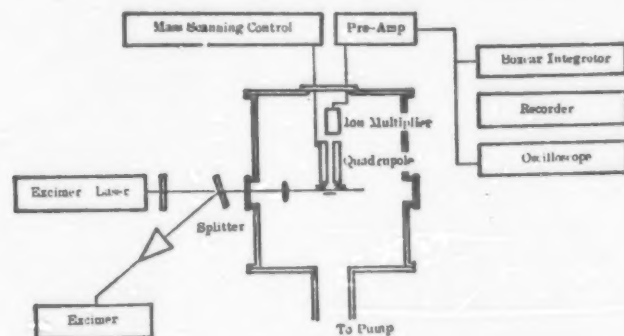


Fig. 1 Schematic diagram of MPI mass spectrum experiment

9717
CSO: 4009/60

AN INTERFERENCE METHOD FOR PATTERN RECOGNITION

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 6 No 3, Mar 86
pp 193-198

[English abstract of article by Lu Zhenwu [4151 2182 2976], et al., of
Changchun Institute of Optics and Fine Mechanics, Chinese Academy of Sciences]

[Text] In this paper, an interference method for pattern recognition is proposed. A test pattern may be compared with a reference pattern by overlapping the two transparent patterns with a lateral displacement in a coherent beam. If the two patterns are sufficiently similar, regular parallel fringes will modulate the common Fraunhofer diffraction pattern of the two samples being compared. The regularity of the interference fringes is a measure of the similarity between the two patterns. The effect of even a small relative rotation, however, will severely limit the region of regularity of the fringe patterns.

THEORETICAL CALCULATION OF POLARIZATION MODULATED TWO-PHOTON SPECTROSCOPY

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 6 No 3, Mar 86
pp 212-219

[English abstract of article by Cai Jiguang [5591 4949 0342], Xia Huirong [1115 1979 2837] and Zheng Yishan [6774 0001 0810] of the Department of Physics, East China Normal University]

[Text] Based on the density matrix equations with 3-j symbol expression, we calculate the intensities and lineshapes of fluorescence signals for two-photon transitions between homonuclear diatomic molecular singlet electronic states which have a near-resonant intermediate enhancing level. Calculations have been made for interactions between a variety of polarization modulated laser fields with three level systems. Signals obtained by the phase-sensitive detection method show that either the circular polarization modulated two-photon spectroscopy (CPMTPS) or the linear polarization modulated method (LPMTPS) could be used to eliminate the Doppler broadening background caused by the adsorption of two photons from one beam. In addition, these methods could be used to identify the specific branches of the two-photon lines from their irregular spectral structures without the need of knowing the upper level constants. Signal ratios of equal-frequency two-photon transitions under circular polarization modulation conditions to those with linear polarization modulation have been listed for all branches with $\Delta J = \pm 2, \pm 1$ and 0. Differences in the results might be orders of magnitude for a reasonably large J value. On the other hand, signal ratios of two-photon branches in the intensity modulated circular polarization laser field to those in linear polarization fields (shown in another list) are all in the same order. In addition, a table is presented to show the relative signal intensities of unequal-frequency polarization modulated two-photon transitions between various electronic states. This might be useful in determining intermediate or upper electronic states of a resolved two-photon absorption line. PMTPS is thus expected to be a useful method for molecular spectroscopy or high-resolution laser spectroscopy.

QUANTUM BEAT IN RESONANCE FLUORESCENCE

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 6 No 3, Mar 86
pp 220-226

[English abstract of article by Liu Liang [2692 2733], et al., of Shanghai
Institute of Optics and Fine Mechanics, Chinese Academy of Sciences]

[Text] The fluorescence intensity of a two-level atom system driven by a two-monochromatic field has been calculated. The results show that the intensity oscillates with time in the long-time limit and the oscillation is the superposition of a series of harmonic waves. The case for maximum oscillation amplitude modulation is reached when one near-resonant monochromatic field acts with an atom, while the difference in frequency of the two monochromatic fields is equal to the Rabi frequency for the first monochromatic field. We call this phenomenon quantum beat in resonance fluorescence.

PRELIMINARY RESEARCH OF CONTACT PHOTOLITHOGRAPHY BY USING A UV EXCIMER LASER

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 6 No 3, Mar 86
pp 274-276

[English abstract of article by Lou Qihong [2869 4388 3163], et al., of
Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences]

[Text] Excimer lasers are noted primarily for their ability to produce high output powers at ultraviolet wavelengths. This ability has made them attractive for lithography application. Excimer lasers are many times more powerful than conventional deep-ultraviolet sources, like xenon mercury lamps.

An experiment of contact photolithography in the order of a micrometer was demonstrated by using an ultraviolet XeCl excimer laser. An X-ray preionized discharge pumped xenonchloride laser was used to expose a thin layer of resist. The laser, which emits at 308 nm, delivered 10 MW of peak power in a $2 \times 2 \text{ cm}^2$ beam. A chromeon-quartz mask, with features ranging from $1.0 \sim 10 \text{ }\mu\text{m}$, was employed for contact photolithography.

After optimization of the laser power intensity on the resist, the best laser power intensity for contact photolithography was found to be about 0.2 J/cm^2 under our experimental conditions. The pattern on the resist shows that line-widths down to $1.5 \text{ }\mu\text{m}$ can be resolved, and $2.5 \text{ }\mu\text{m}$ lines can meet the requirements of LSI.

This technique has great implications for photolithography because it has high resolutions and ultra-fast exposure times.

REAL-TIME VIBRATION MEASUREMENT BY IMAGE HOLOGRAPHY AND PHOTODETECTION

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 6 No 3, Mar 86
pp 281-283

[English abstract of article by Wang Ce [3769 4595] of the Laser Research
Laboratory, Suzhou University]

[Text] A system for real-time measurement of vibration using image holography and photodetection is described in this paper. This system can be used to measure samples having rough surfaces with poor reflectance. The photodetection instrument required here is very simple. Some examples of the measurement are given.

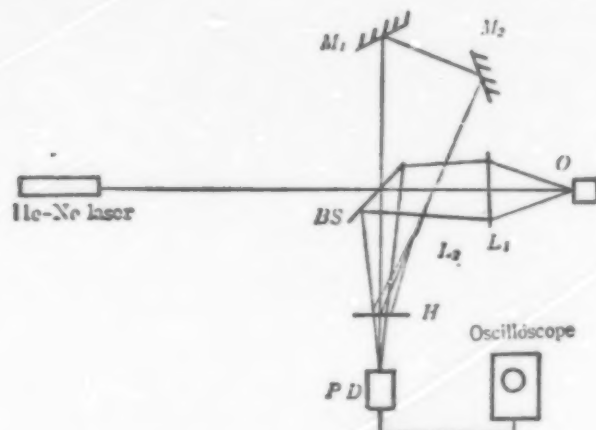


Fig. 1 Configuration of the measurement system

9717

CSO: 4009/55

END

JPRS-CST-86-024

18 JUNE 1986

China Report

SCIENCE AND TECHNOLOGY

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

18 JUNE 1986

CHINA REPORT

SCIENCE AND TECHNOLOGY

CONTENTS

PEOPLE'S REPUBLIC OF CHINA

NATIONAL DEVELOPMENTS

Japan, PRC Technical Cooperation Discussed (Masaru Saito; KEXUEXUE YU KEXUE JISHU GUANLI, No 2, 1986).....	1
PRC Earmarks More Funds To Fight Pollution (XINHUA, 28 Apr 86).....	7
Metallurgical Industry Focuses on Pollution Control (XINHUA, 18 May 86).....	8
Regulations Give Greater Autonomy to Research Units (XINHUA, 8 May 86).....	9
Research Institutions Urged To Support Major Enterprises (XINHUA, 10 May 86).....	11
Necessary Conditions for Joint Ventures (Keizo Umeda, et. al.; KEXUEXUE YU KEXUE JISHU GUANLI, No 2, 1986).....	12
Record Number of Awards for Scientists, Inventors (XINHUA, 8 May 86).....	16
New Regulations Seen as Catalyst for Scientific Reform (CHINA DAILY, 17 May 86).....	18
Briefs National S&T Achievements	20

APPLIED SCIENCES

Review of Aerodynamic Characteristics of Reentry Vehicles (Huang Zhicheng; KONGQIDONGLIXUE XUEBAO, Vol 4, No 1, Mar 86).....	21
New Tool Material To Prevent Sparks, Explosions (Wang Funian; JINSHU RECHULI, No 10, Oct 85).....	40

ENVIRONMENTAL QUALITY

Urban, Rural Environmental Work for 1986 Outlined (JIANZHU, 7 Feb 86).....	46
---	----

ABSTRACTS

ENGINEERING

GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] Vol 6 No 2, May 85.....	52
GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] Vol 6 No 4, Nov 85.....	57

NUCLEAR PHYSICS

GAONENG WULI YU HE WULI [PHYSICA ENERGIAE FORTIS ET PHYSICA NUCLEARIS] Vol 10 No 1, Jan 86.....	64
--	----

/12675

NATIONAL DEVELOPMENTS

JAPAN, PRC TECHNICAL COOPERATION DISCUSSED

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENTIOLOGY AND MANAGEMENT OF S&T] in Chinese No 2, 1986 pp 4-6

[Article by Masaru Saito, professor, Chuo University, Japan: "On Technical Cooperation between Japan and China"]

[Text] I. Chinese Technological Strategy

At present, China is heavily engaged in the development of the focal point of its four modernizations. In its strategy to introduce foreign capital, China has strenuously studied the experience of other countries and adopted policies most favorable to China such as various policies about modernization, advanced industrial systems, and management and technology transfers which have nearly all been adopted. However, the focal points are still on the following aspects: 1) transplanting new industries; 2) strengthening management and technology transfers; and 3) doing its best to acquire better results for the four modernizations.

At present, China is trying, through various ways and means, to achieve technology transfers from foreign countries which concentrate not only on the "hardware" but on the "software" as well; they are not only introducing engineering technology but are also interested in the technology of management. They have corrected their shortcoming in the past of looking down on management and are striving to introduce enterprise management from the developed countries under the economic conditions of the free market.

From now on, the focal points of the Chinese technological strategy are: 1) to strive for the development and application of advanced technology in order to serve important areas of national construction. 2) To strengthen technological innovation and create a better structure for industry. 3) To strengthen the introduction, development, and computer technology. 4) To hasten the reform of economic and technology systems and their internationalization. 5) Considering the stage of technological development in China, technology transfers in addition to development based on self-reliance, are still crucial. The really necessary "four transfers" advocated by the Chinese government, which include science and technology transfers, must be carried out from foreign countries to China, from military to civil application, from coastal areas toward the inland, and from

laboratories to the site of production. However, there exist many problems in their realization. 6) In order to put the transferred technology into production, cultivation of talent is also one of the strategies adopted by China at present.

II. Structure of Technology Transfer

In the past few years, the Chinese technology transfer market has been expanding rapidly and according to various patterns. In addition to trade, foreign investment, and technology cooperation, various routes of technology transfer have been opened. For example, the number of technology delegations and the people sent abroad for long- and short-term study increases year after year and this increase has occurred on a nongovernmental basis.

Now, there are graduate students in the big, medium-size, and small enterprises in Japan, and among the countries which have technological cooperation with Japan, China has the greatest participation.

China has introduced a great number of complete sets of equipment, such as complete sets of chemical engineering equipment in Shanghai, Zhejiang, and Tianjin; complete sets of thin-film manufacturing equipment in Gansu, Shanghai, and Tianjin; and complete sets of television set manufacturing equipment. In the technology trade in 1983, Japan has 41 percent of the total amount of the technology introduced into China, the United States has 30 percent, West Germany 9.5 percent, and Italy 6.5 percent.

The characteristics of the market of introducing technology into China are these: 1) speaking in terms of region, the large cities are the focal points and most of the technology introduced is concentrated in Shanghai, Tianjin, Beijing, and the Shenzhen Special Economic Zone; 2) in technology introduction, expenditures on "software" are mounting; and 3) the demand for high technology is increasing.

In addition, various kinds of high technology have been introduced through trade. It is said that the list of the Chinese delegations shopping for technical equipment abroad also includes: 1) satellite navigation systems; 2) tracking radar and laser range finders; 3) night vision equipment; 4) military vehicle simulators; 5) giant lathes for large-caliber cannons; and 7) though the introduction of technology for medium-size and small enterprises is vigorously advocated, the proportion of introduction into large enterprises and military technology has been greatest.

In addition to licensing, China has also introduced a large amount of technology through the purchase of machinery and complete sets of equipment. The major countries exporting technology in China in 1983 are Japan (25.9 percent, occupying first place), the United States (13.0 percent), Hong Kong (8.0 percent), Canada (7.5 percent), and East Germany (5.7 percent). From now on, Japan and the United States may become the center, and the introduction of technology from the developed Western countries will increase with the emphasis on introducing industrial technology from Japan and military and aircraft-related technology from the United States.

Japan occupies the first place in almost every aspect of technology transfer to China. In particular, Japan has accepted a great number of Chinese graduates majoring in various areas of technology. Even an analysis of the history of technology transfer to China up until now would produce the conclusion that China is in the climax of technology introduction.

Technology transfer from Japan has involved a wide range of technology in agriculture, and also other areas, such as industrial measuring-instrument technology, special natural gas valve manufacturing technology, electron microscope manufacturing technology, air compressor manufacturing technology, and industrial sewing machines. Medium-size and small enterprise technology introduction has also increased rapidly.

Looking at strategy, technology transfer requires the mutual efforts of technical personnel from both sides and that requires a better mutual understanding.

III. Strategies of Technology Introduction

The strategy of technology introduction in China is first to make choices in technology based on the overall strategy and then to introduce certain technologies according to the plan. The characteristics of Chinese strategy in the introduction of technology related to people's livelihood are to attract technology to the country and to wait for the opportunity of international technology exhibitions to bring the practical technology into China after the acquisition of all the information, after which the discussions and transactions will proceed. The key to the discussions and the conclusion of transactions is completely determined by negotiations, and there is a substantial difference compared with practices in the developed capitalist countries.

In the procedure of technology introduction, China has first chosen urgently needed suitable technology and has carried out discussions with the companies related to that technology transfer. China also attracted tangible technology into the country through international technology exhibitions. In the discussion and the conclusion of transactions, the Chinese usually adopt a triangular negotiation pattern, which means to negotiate with both the company from which the technology is expected to be transferred and some other foreign company, that is, to open discussions among the foreign enterprises transferring that technology. The discussion item by item and category by category and the parts which can be locally manufactured are excluded from the discussion. People who attend the discussions are technical experts, experts in commercial affairs, financial experts, and legal experts, and through the coordination of these experts, they attack on many levels to increase their negotiating strength.

The experts on commercial affairs and the legal experts have carefully studied the "Charter of Activities on Technology Transfer" of the United Nations and

they are masters of the laws of industrial ownership. In the last few years, Chinese professional teaching materials on technology introduction have increased day by day.

According to the regulation of the policy published in 1979, articles which can be manufactured in the country will not be introduced regardless of price. In the introduction of complete sets of equipment, those which can be manufactured in China must be excluded; redundancy must be avoided; and the countries or enterprises will be chosen where parts, components, and raw and processed materials can be reasonably supplied. The stipulation mentioned above is a technology introduction policy based on technology transfer, and that technology transfer will in the long run be beneficial to the vigorous development of the country.

Technology introduction, in addition to patents, also includes the introduction of new mechanical equipment and foreign companies can proceed in the manner of investment. Therefore, these points can also be taken into consideration.

IV. Sino-Japanese Technological Cooperation

China, before the implementation of the open-door policy, received little economic and technolog cooperation from the West. The acceptance of cooperation without compensation began in 1981. Cooperation with compensation for the sake of realizing the open-door policy cannot be expanded without considering the ability to pay. The value of technological cooperation reached its climax in 1981; since then the change has been small. In general in cooperation without compensation, a big project is the Sino-Japanese hospital (completed in 1984). In addition, the construction work on the Beijing Post and Telecommunications Training Center and on the Chinese Meat Foods Multiple-research Center is continuing. The focal points in cooperation with compensation are items of basic construction such as railroads, harbors and dams, and telephones.

In technological cooperation, the number of graduate students and professionals sent abroad and the number of engineering projects involving technological cooperation are increasing rapidly. Of the foreign countries helped by Japan, China has been number one since 1982; however, counting in terms of the average population helped by Japan, China is still last.

The developed countries entered the Chinese market through the centers of coastal cities such as Beijing, Tianjin, Shanghai, and Guangzhou. Manchuria is the place of principal resources and an area of heavy industry in the north, though the developed countries felt that the level of technological cooperation there was not enough.

China has been emphasizing agriculture. Therefore, it has achieved very good results in the development of agriculture. In industry, China as well as other socialist countries stressed the development of heavy industry. Thus the development of light industry and medium-size and small enterprises slowed. At present, China is striving for the development of medium-size and

small enterprises and their modernization to maintain the development of heavy industry, strengthen the flexibility and adaptability of the national economy, and stimulate the vitality of the enterprises.

V. Problems of Technological Cooperation

China is a socialist nation. Therefore, both the selection of the graduate students sent abroad and their work assignments can be done according to the plan. The medium-size and small enterprises in Japan accept a great number of graduate students each year but provide mainly on-the-job-training and are not professional training organizations. The students work very hard, yet the results of their study are low. Since there are more than 20,000 Chinese graduate students sent to our country each year, we had better adopt a more systematic method to do it. And this is consistent with the direction of "education cooperation" flourishing in Japan.

China is walking along the road of socialism, and maintaining independence, and keeping the initiative in its own hands, which contrasts sharply to the capitalist market of free competition. Though it uses the same techniques, the function and meaning are different. Nevertheless, even the technology from capitalist societies can contribute to the development of socialism. The developed countries in the West and East have blocked technology transfers to the Eastern countries in the name of "Coordinating Committee for Export to Communist Areas." This has been relaxed to a great extent to China in the past few years, yet it has not been abolished and may become strict again.

Chinese patent law was implemented in April 1985. To introduce advanced technology, patent rights must be acknowledged and the technology rightly protected. Proper implementation and observation of the law have a direct influence on the international prestige of a country. As for the suppliers of technology, if the technology is not protected under the law, they will no longer transfer their technology. Whether the Chinese are able to enforce the patent law correctly to provide sufficient protection to the rights of the technology suppliers is one of their great tasks. We can also say that the above understanding will apply the same to the foreign investment law, corporate law, and commercial trade law under formulation now.

In the following article, we will talk about the relation between the "four modernizations" advocated by the Chinese and Sino-Japanese technological cooperation. Military and national defense modernization is included in the four modernizations. For some reasons, Japanese technology cannot cooperate in every aspect of the four modernizations.

Finally, I think that all the developed countries, including Japan, seem to compete for cooperation in the technology transfers to China, yet it is not clear at present whether the introduction of technology into China is for the development of Chinese socialism, which is introverted, or for the joining international (export) competition, which is extroverted. Even if Chinese technology introduction is extroverted, it may not for the developed countries end up in eating one's own bitter fruit (Chinese version [Japanese to Chinese translator's note: that is, the possibility of China's becoming a developed

country and competitor), owing to the huge gap in the levels of technology between China and the developed countries, but to the NIC's in Asia and the countries of Southeast Asia, China is very likely to become a competitor. For industrial products of equal quality, especially the production of labor-intensive products, once export becomes possible, their impact on the large countries will be enormous. In case the coordination of shared production ([Japanese to Chinese] translator's note: that is, different countries produce different products) cannot proceed smoothly, it is very likely that trade conflicts will occur between China and the Asian NIC's and the countries in Southeast Asia. If the current Chinese open-door policy continues as it has, in the 1990's Chinese exports of industrial products will increase rapidly.

To solve the above problems and then maintain and accelerate the development in Asia to contribute to the peace of the world, it is necessary to establish, through Chinese economic development and her joining the shared production structure, a healthy interdependent relationship at least in Asia. And Japanese technology transfers must proceed in line with the contribution to that relationship.

12909/13104
CSO: 4008/2086

NATIONAL DEVELOPMENTS

PRC EARMARKS MORE FUNDS TO FIGHT POLLUTION

OW280933 Beijing XINHUA in English 0735 GMT 28 Apr 86

[Text] Shanghai, 28 Apr (XINHUA)--China will spend two-and-a-half times as much on fighting pollution over the next 5 years as it did in the 1981-1985 period, an environment official said today.

The country will earmark an average of five billion yuan a year for environmental protection during the Seventh Five-Year Plan (1986-1990), said the official, who is organizing a current international fair in Shanghai on anti-pollution equipment and technology.

The fair, which is being sponsored by the Shanghai branch of the China Environmental Protection Industry Association and six other organizations, is being attended by 10 foreign firms and 200 Chinese manufacturers, colleges, and research institutes.

The official told XINHUA: "China now has 1,100 environmental protection and monitoring stations above county level, which employ 32,000 people."

More than 1,200 factories across the country were now making 1 billion yuan worth of anti-pollution equipment a year, he said.

Forty colleges have opened environmental protection courses, and 106 research institutes were specializing in environmental protection.

/12624
CSO: 4010/54

NATIONAL DEVELOPMENTS

METALLURGICAL INDUSTRY FOCUSES ON POLLUTION CONTROL

OW180800 Beijing XINHUA in English 0732 GMT 18 May 86

[Text] Zhengzhou, 18 May (XINHUA)--The metallurgical industry ministry will double its investment in anti-pollution measures to 1.7 billion yuan in the 1986-90 period, on the basis of its success over the past 5 years.

Drawing experience from industrially developed countries, the ministry has set up a research institute of environmental protection, installed waste-treatment facilities and formed an environmental protection system involving more than 20,000 people since 1978. It has also engaged in an extensive tree-planting drive.

As a result, the rate of harmless discharged waste reached 58 percent in 1985, up from 28 percent in 1982. The ministry recorded an extra output value of 1 billion yuan in the 1981-85 period by making a comprehensive use of the waste gas, water and industrial residue.

Swarms of fish have returned to the Lianhua River near the Capital Iron and Steel Company, once notorious as a source of pollution.

The metallurgical industry saves 800 million cubic meters of water a year by recycling waste water, and uses large amounts of slag to produce cement and fertilizer.

By the end of 1985, the nation's 36 major metallurgical enterprises had planted 13 million trees and laid 1 million square meters of lawn.

/12624
CSO: 4010/54

NATIONAL DEVELOPMENTS

REGULATIONS GIVE GREATER AUTONOMY TO RESEARCH UNITS

OW091221 Beijing XINHUA Domestic Service in Chinese 0658 GMT 8 May 86

[Text] Beijing, 8 May (XINHUA)--The State Council recently promulgated the "Provincial Regulations on Expanding Decision-making Powers of Scientific and Technological Research Organizations."

In order to add vitality to scientific and technological research organizations and to enable them to become self-governing, scientific-technological research and development entities, the State Council's document specifies that: With the guarantee of accomplishing the tasks assigned by the state as a precondition, research units are authorized, based on their respective capability and specialty, to undertake scientific and technological projects in various sectors of society, according to the needs of social, economic, scientific, and technological development. They are also authorized, based on the principle of self-determination and mutual benefit, to establish various forms of cooperative relations with enterprises, design units, and institutes of higher learning, or to set up joint ventures with them. Departments at a higher level should encourage and support them, instead of imposing restrictions. Research units may also earn legal profits by entering into contracts with other units regarding technological development and transfer, and using technologies to serve society.

The document specifies that administration and management of a research organization are the responsibility of the director of that organization. The director of a research organization is responsible for overseeing the organization's research and administrative work, and the deputy director should assist the director in his work. The director of a research organization is to be appointed and removed by a department at a higher level, and the deputy director is to be nominated by the director and his name submitted to higher authorities for appointment or removal. Both the director and deputy director of a research unit are to be appointed for a specified term of office, and they may be reappointed on completion of their term. The director of a research organization is authorized to appoint or remove middle-level administrative cadres in his organization. Retention or appointment of specialized technical personnel should be carried out in accordance with relevant state regulations. Research organizations should take measures to

NATIONAL DEVELOPMENTS

RESEARCH INSTITUTES URGED TO SUPPORT MAJOR ENTERPRISES

OW101647 Beijing XINHUA in English 1428 GMT 10 May 86

[Text] Beijing, 10 May (XINHUA)—The GUANGMING DAILY today urged major research institutes to work with China's largest state-run enterprises to boost the country's production and scientific research.

In a commentary, the cultural paper praised the work of institutes with smaller production units but said the link between major institutes and enterprises was only "at the initial stage."

Products and equipment of many of the larger enterprises are out-of-date, and it is difficult for them to improve their technology without outside help, the paper said.

China's major institutes could offer that help, said the paper. The institutes have the knowledge, equipment and the technical staff, and in the past they too often engaged in research "separated from production and on subjects not always closely linked to the country's needs."

As an example of institute-enterprise cooperation, the paper praised the joint effort of the Shanghai Institute of Silicate Research, an affiliate of the Chinese Academy of Sciences, and the Shanghai general petrochemical plant.

With the institute's help, in just 5 months the plant was able to upgrade its 7,000 meters of heating pipes, saving 7,000 tons of crude oil worth more than 400,000 yuan a year.

/8309

CSO: 4010/55

improve management and promote the democratic management system. They may set up a committee to handle the general affairs of their organization, as well as an academic or technical affairs committee; and may organize a staff and workers' congress, or set up other democratic management organizations. They should fully respect, and give play to, the role of technical workers and other staff and workers in examining the organization's major decisions; in overseeing leaders at various levels, including the director of the organization, and in safeguarding the legal rights and interests of the workers.

Regarding personnel management at research organizations, the document specifies that: All research organizations receiving funds from the state are authorized, within the organizational size authorized by the state, to make their own decisions on recruitment, dismissals, and arranging jobs for personnel of all divisions on the basis of a reasonable personnel structure and according to the relevant state regulations. Research organizations fully operating on their own funds may make their own decisions on retaining personnel required to carry out their organizations' work, provided that the personnel management system of the state is observed. For those personnel assigned to a research organization, the organization should put them under probation and evaluate their performance. It is authorized to refuse to accept those personnel whom it considers unsuitable for its work, or send them back to their original units while they are still under probation. Research organizations should expand the authority of their project managers. Project managers should be given the power to arrange their personnel according to the needs of their work.

The document specifies that: Research organizations are allowed to make their own decisions on how to use funds gained through different channels according to relevant state regulations. Research organizations' income from technical sources is temporarily exempt from income tax. New products and intermediate-test products of research organizations will be exempt from tax, or taxed at reduced rates, according to established regulations.

Research organizations fully operating on their funds should set up a fixed asset depreciation system as enterprises do. They are also authorized, according to relevant state regulations to dispose surplus equipment and materials other than large and precision instruments and equipment invested by the state. Research organizations, in the process of financially supporting themselves, should try to set up a similar system as their financial self-sufficiency permits. Research organizations should make every effort to increase the rate of utilization of large and precision instruments and equipment. They should also provide service to the public or enter the leasing business. A large portion of income from these sources should be used to modernize the organization's fixed assets. The state will selectively provide support for construction of research bases, and large and precision instruments and equipment for research organizations.

/8309

CSO: 4008/64

NATIONAL DEVELOPMENTS

NECESSARY CONDITIONS FOR JOINT VENTURES

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENTIOLOGY AND MANAGEMENT OF S&T] in Chinese No 2, 1986 pp 6-7

[Article by Keizo Umeda, Himeji Junior College, Hyogo Prefecture, Japan; rewritten by Yong Qian [0516 3677], Zhao Beiwan [6392 054 2598], chief editor: "Necessary Conditions for Joint Ventures"]

[Text] In a world where science and technology progress day by day, it is rather difficult to be outstanding among other competitors; therefore, every enterprise tries to change the structure of its industry and technology and consolidate its position through joint ventures.

However, there are also lots of examples of termination of an agreement of cooperation among the developed countries. At present, the conflicts are acute. In general, joint ventures have the following problems:

1. The items of joint-venture enterprise are more mature, so the introducing country loses the characteristics of being a new producer and also loses the true significance of joint ventures. Thus a joint-venture enterprise can be banned easily by the mother company.
2. Owing to the recession of joint-venture enterprises, their strategies of management must change; otherwise the result will be that the investor country cuts its investment and limits it to a small amount of capital or recalls its total investment. Consequently, the other party revokes the administrative power of the investor.
3. The elimination of obstacles to both parties on the basis of mutual understanding and mutual trust between the two partners not only in appearance and formality but also in an honest and sincere exchange of opinions and management.
4. In case difficulties or problems in management emerge in the mother company, the contract is cancelled and the enterprise is managed independently by a single party.

Therefore, it is necessary to summarize conscientiously the causes of failure of joint-venture enterprises and pursue the ways and means of success and improvement.

Sources from multinational enterprises in Europe and Japanese enterprises abroad reveal that the causes of failure of joint-venture enterprises can be summed up as follows: incomplete market research and inadequate investigation within the enterprise, poor management by the mother company, and a change in foreign investment from the mother company.

The causes of failure from the local society include inconsistency of opinions with the [mother?] company and external causes, mainly from an economy that is overproducing. To avoid the above-mentioned occurrences, the key is to maintain harmony with the local enterprises and collect information from the client countries to become mutually prepared; select the places for local investment, analyze the characteristics of the products and the competitive situation, predict the buying power of the joint-venture enterprise, and determine the purchasing price, conditions, and commercial customs, according to the size of the market; and analyze, through the cycle and according to the cost of transportation, the conditions for production equipment, materials, regulations about the social effects of pollution, and labor in order to explore the productivity of the enterprise, the tax system, capital transfers, and the budget. The most important among the conditions mentioned above is how to make a selection. It affects whether the enterprise can be successful or not. Besides, it is necessary to study further the culture and history of the host country in order to communicate for the joint-venture enterprise and eliminate misunderstandings. Also attention must be paid to the distribution of authority. It is necessary to conduct technology transfers and develop new technology on a broad scope from manufacturing and processing to management.

In technology transfers, it is important to introduce new technology; however, it is even more important to develop new technology. If new technology is developed, there will be room in both the developed and the developing countries for technology transfers. Modern multinational enterprises do not rely on capital or ownership but pay attention to the distribution of production in order to enhance the cooperation between East and West.

Nevertheless, the essence of joint-venture enterprises is to enable the partners to draw on the strengths of each to offset the weaknesses of the other to maintain the cooperative system. Once mutual trust is established among the partners, it is necessary to overcome any difficulties; otherwise, that organization is bound to collapse, no matter what it is. This is what we should always remember.

But in the past few years, the international investment environment has changed and some new problems need to be solved urgently. As we saw in Iran, even in a so-called stable market and host country, with revolution, internal disorder, and war and with the ending danger of a termination of the projects in progress and a takeover of capital before fulfillment of the contract, the future situation can be hard to imagine. Countries with an accumulated debt include most developing countries striving to carry out their economic

policies but these countries are still thought to be the most promising countries as host countries for investment. However, because of the accumulated debts, the profit received by the host country is greatly limited and, as a result, the reinvestment of that profit in the host country by the investor is limited.

Thus, there are strategic measures such as the signing of an investment protection agreement between the investor and host countries in order to lessen or minimize the investment danger.

In China there are in general many achievements in the acceptance of foreign investment, but the following problems still exist: 1) there is more cooperation based on an agreement but few on joint venture; 2) more capital comes from Hong Kong and Macao compatriots and little comes from foreign enterprises, or consortiums; 3) there are more medium-size and small items but few large ones; 4) there is more investments in tertiary industries but little in manufacture for export; 5) in intended investments which have been revealed, there are more items which require longer terms of negotiation while few eventually arrive at a satisfactory conclusion; 6) the amount of investment stipulated in the contract is high while the actual investment is low; 7) more foreign investment is introduced but foreign exchange created with the foreign investment is little.

In joint-venture enterprises with investment from Japan, from basic enterprises to enterprises representing a great volume of trade, and if underwater operations are included, along with the increase in the number of joint-venture enterprises, the kinds of the enterprises have also expanded in many aspects, from the servicing and manufacture of motors or generators and fiber products to the manufacture of automobiles.

The reasons for the rapid growth in Sino-Japanese joint ventures are, first, because China has made great efforts to expand favorable treatment and enhance the law. However, the problems caused by the increase of joint-venture enterprises have become cleared. The main problems are the following: now, in the joint venture, the most troublesome thing for the Japanese party is the pricing of land and the second is the insufficiency of transportation at the harbors, which affects exports. Therefore, the harbors need to be reorganized and enhanced and new ones built. Third, people do not quite trust the supply of energy and raw materials. Though the supply of energy and raw materials for joint-venture enterprises has priority, severe energy shortages in the country exist, especially in electricity, and when joint-venture enterprises increase later on, the stable supply of electricity in some places may experience some difficulties. Fourth, the sovereignty of labor enterprises, yet the enterprises can only recruit workers in the suburbs; they hope to recruit the finest workers in an wider area but there exist difficulties in applications for residence in the municipalities. Furthermore, wages tend to rise, especially when there is a shortage of people who can speak foreign languages, and their wage increases have been great. Besides, there are some problems in labor control. In the establishment of some joint enterprises, some managers think they must fully realize the meaning of the existence of the labor union. The fifth problem relates to the regulations about the

distribution of foreign exchange and the strengthening of the obligations to export. Owing to the strict control policy over foreign exchange, joint-ventures enterprises or those based on technological cooperation with foreign countries worry about their production being caught up in difficulties, and so foreign exchange capital must be positively supplied for the importation of advanced foreign technology by local export industries. If foreign exchange capital becomes more flexible and accommodating, the foreign exchange control will be relaxed a little, and thus the obligation to export for the joint enterprises will be strengthened. Sixth, along with the progress of technology transfer, some disputes over the expense of technology transfer will arise. In the introduction of foreign advanced technology, some Chinese in charge do not know about paying technology consulting fees, fees for using others' patents, and deposits for security. For example, the unwillingness to acknowledge the value of some technologies is the biggest stumbling block in the trade for foreign enterprises to transfer technology to China. In the future, in the cooperation between China and foreign countries, if China does not acknowledge "technology fees," the work of introducing advanced technology will not be able to proceed smoothly. The seventh problem is the restriction of investment proportions in joint enterprises. China has strict restrictions on the number of enterprises that have foreign capital in the majority, which is contradictory to the regulations of joint-venture enterprises. The final important thing is the terms of the joint enterprise. The Japanese enterprises hope that the term designated by the current regulations will be extended appropriately.

12909/13104

CSO: 4008/2086

NATIONAL DEVELOPMENTS

RECORD NUMBER OF AWARDS FOR SCIENTISTS, INVENTORS

OW081352 Beijing XINHUA in English 1232 GMT 8 May 86

[Text] Beijing, 8 May (XINHUA)—China announced here today that 1,761 scientific research achievements, including the "Changzheng No 3" carrier rocket, have won national awards for promoting scientific and technological advances.

Premier Zhao Ziyang and other state leaders will soon award prizes to more than 3,800 scientists and inventors who have made great contributions to their country, at a national meeting for scientific and technological rewards to be held here next week.

This is the largest number of awards for scientific and technological research since the founding of the People's Republic of China in 1949.

"It is unprecedented in China's history to reward so many scientists, inventors and technicians," a spokesman for the state science and technology awards office said.

He explained that the purpose is to encourage scientists and technicians and bring into full play their initiative and creativity in order to accelerate the nationwide modernization program.

The 1,761 winners were chosen from 20,000 scientific research achievements by a 57-member committee over the past seven months.

They cover a wide range, including national defense, machinery, electronics, chemistry, metallurgy, light and textile industry, agriculture, forestry, medicine, power, transport, and other sectors.

These scientific research achievements have yielded remarkable social benefits and economic returns—estimated at 110.8 billion yuan in total.

The facts show that they have played an important role in developing the national economy, national defense and other sectors. They will play greater role in accomplishing the Seventh 5-Year Plan (1986-1990) and help narrow the gap with the advanced nations of the world.

According to the committee, the special-class awards were given to 23 achievements, including the "Changzheng No 3" carrier rocket, a water-injection technique to help Daqing, China's largest oilfield, sustain a stable and high output, and a technique for producing maleic rubber.

The first-class awards were given to 135 achievements, while 535 achievements won the second-class awards, and 1,068 achievements the third class.

/8309

CSO: 4010/55

NEW REGULATIONS SEEN AS CATALYST FOR SCIENTIFIC REFORM

HK170712 Beijing CHINA DAILY in English 17 May 86 p 4

[Editorial by CHINA DAILY Commentator: "Science Reform"]

[Text] Science reform has taken another big step forward with the recent promulgation of the new regulations on enlarging the decision-making power of scientific research institutes throughout the country.

The regulations list only two requirements for these institutes. First, they must be committed to fulfilling the tasks assigned them by the state. Second, their chief executives, who will now shoulder more responsibility, are appointed and removed by higher authorities. When these two prerequisites are met, they are free to do whatever they think fit so long as their activities come within the bounds of the laws and decrees of the state.

The director of a research institute is in complete charge of all work, professional and administrative. And the institute has the power to hire and discharge according to requirements--a guarantee that all personnel doing research are completely qualified and competent. Overstaffing, as is the case with some institutes, will be prevented or remedied.

With regard to funds obtained through different channels, institutes have the power to spend them at their own discretion without outside interference. For instance, they can set up foundations for development, welfare and bonus purposes. And they can dispose of their surplus facilities and materials in compliance with state regulations. With the approval of government offices at ministerial and provincial levels, a research institute can directly conduct cooperative and exchange activities with foreign counterparts.

Most important is that, according to the new regulations, an institute is vested with the power to undertake from any quarter all kinds of scientific and technological tasks based on the needs of social, economic and scientific development, as long as it has the prerequisites. It can, on the principle

of free will and mutual benefit, forge cooperative ties in various forms with enterprises, designing units and colleges. And it can enter into contracts with other units in terms of technical development, transfer and application, all in the interest of society, and obtain income through these channels. Thus, the achievements of research, now marketable commodities, are made more easily available to those who need and intend to buy them.

Pilot experiments have revealed that great advantages can be had from such practices as are now embodied in the new regulations. Some of the most important ones are: the working initiative of the staff can be actuated; the successful results of scientific research can be more readily popularized in production processes; science and technology can be better geared to the requirements of the national economy to boost the modernization drive; and, finally, the institute can more effectively tap its own potential and streamline management.

Reform in the management system of science and technology aims primarily at furthering integration of the two with the development of the nation's economy so that both can better serve China's modernization programme.

/8309

CSO: 4010/55

NATIONAL DEVELOPMENTS

BRIEFS

NATIONAL S&T ACHIEVEMENTS--Beijing, 2 May (XINHUA)--Thanks to the hard work of more than 100,000 scientists and technicians, 38 key state scientific-technological projects have been completed according to schedule under the Sixth Five-Year Plan. By the end of "February 1986, a total of 3,896 important scientific and technical results had been achieved. [quotation as printed] The application of more than 3,200 of them in production has resulted in a significant rise in economic results. The 38 key research projects covered agriculture, energy, transportation, mechanical electronics, raw and semifinished materials, the consumer goods industry, and new technological and social development. The development of more than 327 new seed strains has increased China's annual grain output by about 20 million jin. China's output of polyester short fibers has been boosted by the manufacture of whole sets of equipment. [Summary] [Beijing XINHUA Domestic Service in Chinese 1347 GMT 2 May 86 OW] /8309

CSO: 4008/64

APPLIED SCIENCES

REVIEW OF AERODYNAMIC CHARACTERISTICS OF REENTRY VEHICLES

Mianyang KONGQIDONGLIXUE XUEBAO [ACTA AERODYNAMICA SINICA] in Chinese Vol 4, No 1, Mar 86 pp 88-98

[Article by Huang Zhicheng [7806 1807 3397], China Aerodynamic Research and Development Center: "A Review of Aerodynamic Characteristics for Several Recovery Schemes of Reentry Vehicles"]

[Text] English Abstract: This paper presents a review of aerodynamic characteristics for several recovery schemes of reentry vehicles. These schemes include the aft jettison mass plus parachutes, the sidewise jettison mass-drag cones plus parachutes, towed cones plus parachutes, the drag brakes plus parachutes, the aft jettison mass-drag plus parachutes. The features of pattern of air flow for these schemes, the results of test in wind tunnels and the results of engineering calculation methods are emphasized, then a ballistic analysis and comparison of performance for these schemes are carried out, and the suggestions about the selection of schemes and further work are put forward.

In recent years, recovery of reentry vehicles has been an important technical watershed in developing high level reentry vehicles. In the early period, the aim of recovery was to determine the survival of the warhead reentry into the environment and the safety of the heat resistant design, and evaluate the heat resistant layer of the duantou [4551 7333] and surface and the heat resistant design of the antenna window; in recent years, interest has shifted to factors of erosion of the contour and influence on the tumble moment of force and nonuniform erosion. Low level erosion of the contour in recovery can provide a basis for researching the influence of erosion on aerodynamics; comprehensive assessment of theoretical calculations on erosion of the contour and the performance of duantou indentation rate test devices can also be carried out. To achieve the above recovery aim, it is necessary to reduce the value of the ballistic coefficient after the appearance of the maximum aerodynamic heat environment to 1/2 to 1/3 its original value, and at this time, the contour of the recovery duantou will be close to the landing contour of the actual flight vehicle.^[1]

This paper was received 11 Jan 85; revised ms. received 3 Mar 85.

Jettisoning mass and increasing drag are two basic techniques in recovery technology which can be used independently or combined to achieve the recovery aim. In addition to increasing the drag coefficient, the surface area of the bottom can be increased to increase drag, and since in jettisoning mass the surface area of the bottom is changed. This point should be noted when comparing the deceleration performance of these schemes. Summarizing references from abroad, the following schemes have been studied for reentry vehicles with high ballistic coefficient: (1) aft jettison mass plus parachutes^[2]; (2) sidewise jettison mass-drag cones plus parachutes^[3,4]; (3) towed device plus parachutes^[5,7]; (4) drag brakes plus parachutes^[1,7,8]; (5) aft jettison mass-drag brakes plus parachutes^[1]; (6) angle of attack control scheme^[9,10]. The last scheme is still in the exploratory stages because the lateral overload is very large^[14]. This paper deals primarily with the first five schemes. The aerodynamic problems of scheme (1) are primarily problems of aft jettison mass aerodynamics, scheme (5) is a combination of schemes (1) and (4), thus aerodynamically we will discuss primarily schemes (2), (3), and (4). In addition to the rather mature parachute dynamic characteristics and the dynamic problems, problems in two areas in the aerodynamic problems of these schemes must be solved: 1. the aerodynamics, aerodynamic heat, and the dynamics problems of the recovery body. When comparing schemes, we primarily discuss the drag characteristics of the schemes, paying appropriate attention to the scheme's static stability (generally speaking, adopting increased drag measures will increase static stability) and the aerodynamic heat environment. 2. Aerodynamic problems in the jettison mass process. The aerodynamic problem of aft jettison mass is very close to the drag cone jettison process. For sidewise jettison mass, the problems of the shell and the aerodynamic interference of the recovery body itself must be resolved to avoid collision between the two bodies and excessive disturbance caused by the recovery body^[11].

II. Discussion of Recovery Body Separation Flow

Although the flow of the recovery body has its own characteristics for the sidewise jettison-drag cone, towed cone and brake schemes, there are also some common laws, i.e., there are two types of separation flow, open and closed. Reference [12] pointed out this flow phenomenon when researching supersonic flow around cavities (Fig. 1). For flow between the fore and after body, reference [12] pointed out that for the distance between the fore and after body there is a critical value, and if this value is exceeded, a closed wake appears and if it is smaller than this value, it is an open wake (Fig. 2); it also pointed out that when the ratio of the diameter of the fore and after body comes near to 1, this critical value is a distance two- or three-fold the diameter of the forebody starting with the bottom of the forebody. In the specific scheme, the flow around the recovery body should be much more complex than the above analysis. For the sidewise jettison-drag cone, although the bottom of the front cone may form a closed wake flow, attached flow or separation flow may appear at the front of the skirt. For separation flow depending on different M numbers, Re numbers and skirt shape, can be attached or not attached to the skirt, that is it can form closed or open separation flow (Fig. 3). Qualitatively, if the skirt

angle is too large (e.g., larger than 30°) or if the background stage angle is too great and the Re number is reduced, separation flow can easily form. For the towed cone scheme, an independent towed cone placed in uniform lailliu [0171 3177] also exhibits attached body flow and open separation flow (Fig. 4), but under general situations, an open separation flow even more readily forms in the forebody wake. If there is no rod or cable connection between the fore and after body (relative to the aft jettison mass), generally there is a tuoti [5192 7555] shock wave in front of the towed cone, and at this time the towed cone's drag is greater (Fig. 2b). If there is a rod or cable link in the middle, then the flow diagram is similar to the sidewise-drag cone flow, and at this time the open separation flow that forms diminishes the drag. The drag brake scheme can be seen as a skirt with fengxi [4911 7138], which easily forms an attached body flow or closed separation flow. However, for small purity ratios and medium drag plate angle of deflection, open separation flow was also observed in the wind tunnel tests (Fig. 5). Wind tunnel tests demonstrated that if open separation flow appears on the recovery body, the drag is clearly reduced, thus the appearance of this type of flow should be avoided in design as much as possible.

III. Aerodynamic Characteristics of the Sidewise Jettison Mass-Drag Cone Scheme

When $M_\infty = 3.01, 4.02, 5.05$, wind tunnel tests show that in terms of aerodynamics, the drag skirt scheme is superior to the scheme of making a drag cone in the middle of the column by creating a cavity, the drag cone scheme can easily produce open separation flow but the drag skirt scheme only requires a skirt angle of less than 30° to avoid open separation flow; yet with a similar after cone angle the drag of the drag skirt should be much higher than that of the drag cone; the drag of the drag skirt is much smaller with erosion of the contour and changes in the purity ratio; the pressure center of the drag skirt tends to be behind the drag cone. Since structural factors can actually only make slight cavity drag cones, their aerodynamic properties should be closer to drag skirts. The following results were obtained through experiments with transultrasonic wind tunnel, hypersonic wind tunnel^[14], pao [3517] wind tunnel^[15], shock wave wind tunnel^[15,16], and free flight ballistics^[17]:



a. Closed-type cavity flow $L/M > 14$

b. Open-type cavity flow $L/H < 10$

Fig. 1. Cavity Flow

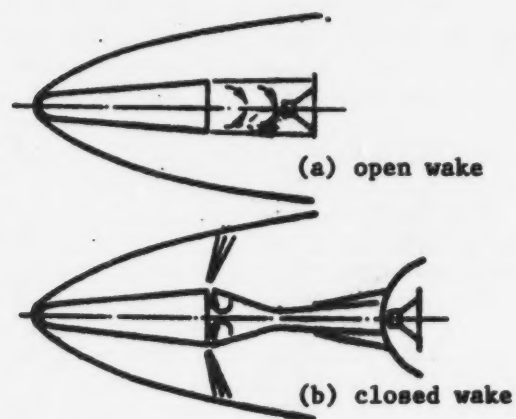


Fig. 2. Towed Cone Flow

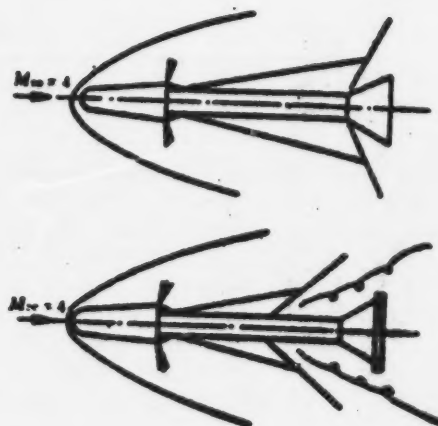


Fig. 3. Flow Diagram of Sidewise Jettison-Drag Cone in Hypersonic Wind Tunnel

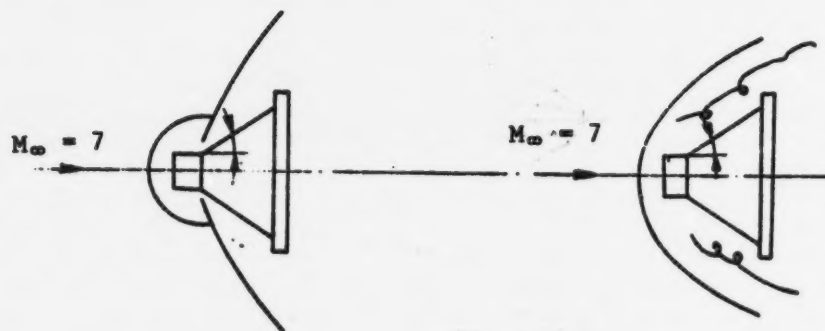


Fig. 4. Flow Diagram of Single Towed Cone in Hypersonic Wind Tunnel

1. The drag cone contour has a clear impact on drag. In the hypersonic wind tunnel, the drag of the contours of after cone angles of 25° and 40° was smaller than the drag of the contour of after cone angles of 30° , if the drag cone has back step it lowers the drag. When $M_\infty = 4.04$, the after cone angle is 30° , after eliminating the step, the drag coefficient increases from 0.26 to approximately 0.60; but then if the after cone angle is 40° , after eliminating the step, the drag coefficient only increases from 0.25 to 0.29. When the after cone angle is 30° , the drag cone becomes four post stretched wings and the drag coefficient reaches 0.54.
2. Purity ratio and changes of the erosion contour have a definite influence on drag. Results of pao wind tunnel and shock wind tunnel tests (Fig. 6) show that increasing the purity ratio makes the drag coefficient drop. In the pao wind tunnel we also tested the influence of erosion contour (including cavity contour, and 55° dual cone contour and flattop contour), and the several contours made the drag coefficient drop. The maximum drop was caused by the dual cone contour which made it drop 9 percent.
3. The test results of free flight ballistic and different wind tunnels testing for the range of M_∞ numbers can be linked (Fig. 7). Figure 7 sets out the results of engineering calculations. Neifuniudun [0355 0126 3662 7319] theory^[18] was adopted for calculating the pressure distribution of the forecone and aftercone. The boundary layer outer edge parameter made the entropy layer swallowing processing, using the common heat flow calculation formula through the Reynolds analogy from heat flow negative thrust friction, for bottom pressure the commonly used experimental formulas in the documents were used. The results of the calculations demonstrated that for situations in which open separation does not occur, the calculations and the test results of the various types of devices were roughly the same. The results of the hypersonic wind tunnel $M_\infty = 9$ and $P_0 = 29$ atmospheres were inclined to be low ($C_D = 0.0.305$), but the value of C_D became higher in $P_0 = 68$ atmospheres ($C_D = 0.329$, represented in the figure by black dots), and at this time the flow field photographs prove that it is attached body flow. The results of $M_\infty = 9$, $P_0 = 60$ atmospheres in this wind tunnel tended to be much lower ($C_D = 0.145$) and from the flow field photographs it could be determined that

at this time an open separation flow appeared. Figure 8 gives the axial force coefficient with changes in the angle of attack. When $M_\infty = 9$, the axial force coefficient increases very rapidly with α , this means that when the angle of attack increases, the skirt's windward side forms an attached body shock wave, and when $M_\infty = 5$ and the angle of attack is zero, an attached body shock wave appears on the skirt front, therefore the axial force coefficient changes rather gently as the angle of attack changes. In free flight tests in the shock wave wind tunnel, when $M_\infty = 8.9$, the drag coefficient also was about 0.18, and at this time $Re = 1.3 \times 10^6/m$. In trans-ultrasonic wind tunnel tests, when $M_\infty = 1.15$, the drag coefficient tended to be much lower and from flow field photographs it could be determined that an open separation flow appeared. It should be noted that there were slight differences in the dimensions model of the free flight ballistic initial test and the model of the hypersonic wind tunnel test, and later tests on similar models were carried out and the drag coefficient found was slightly low (indicated by black dots in the figure). The free flight ballistic shadowgraphs prove that an attached body shock wave appeared on the skirt.

4. In all the tests, no matter what the changes in the contour, within the range of changes in broad M numbers and in the angle of attack, the ratio of pressure center position and model length was greater than 0.8, thus arranging the center of gravity appropriately, a greater static stability plentitude could be obtained.

5. The free flight ballistic test results show that $C_{mq} + C_{ma}$ is a positive value, between 1 and 3, and the results of the calculations using Neifuniudun theory [13] show that when the angle of attack is less than 4° , $C_{mq} = C_{ma}$ is a positive value, thus with a small angle of attack, a negative damping situation can appear.

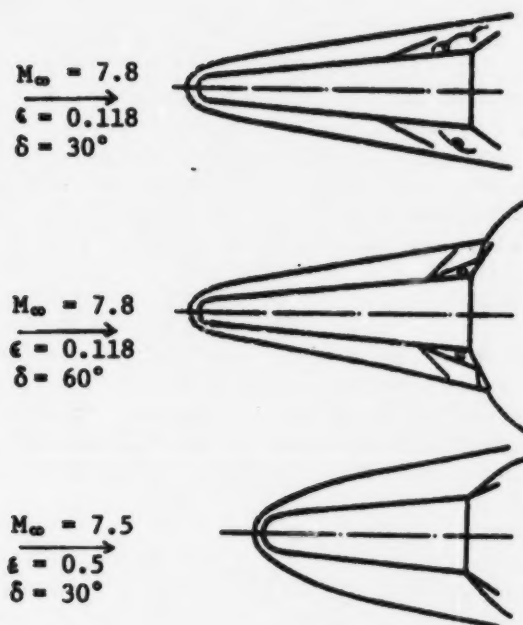
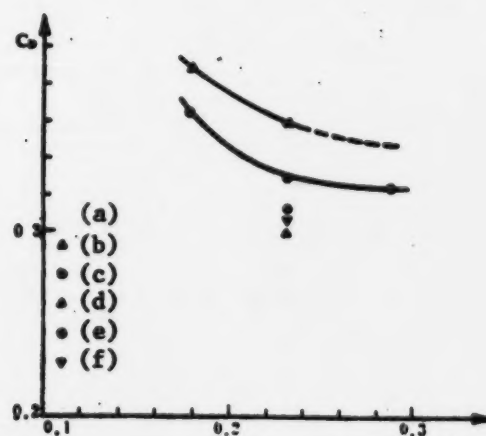


Fig. 5. Flow Diagram of Drag Brake Scheme in Pao Wind Tunnel



Key:

a. Head shape	M_{∞}	$Re^{1/2}/m$
b. Spherical	6.5	1×10^7
c. Spherical	7.8	3.5×10^7
d. Twin cone	7.8	3.5×10^7
e. Cavity	7.8	3.5×10^7
f. Flattop	7.8	3.5×10^7

Fig. 6. Drag Coefficient of Recovery Body Under Sidewise Jettison-Drag Cone Scheme at Zero Angle of Attack With Changes in the Purity Ratio

In addition to force measurement tests, pressure measurement tests of the recovery body were carried out in the hypersonic wind tunnel^[19] and heat flow and pressure distribution measurements were carried out in the shock wave wind tunnel^[20]. The test results show that the pressure and heat flow values on the cylindrical section were lower, and the changes were rather gentle. On the skirt, the results of hypersonic wind tunnel $M_\infty = 5$ when the purity ratio was sharp or small, a peak value appeared in pressure, and when the purity ratio is larger, the pressure grew nonlinearly, but in the shock wave tunnel with a higher M number, peaks appeared in both pressure and heat flow, with the heat flow peak position being slightly forward of the pressure peak position, however, the maximum heat flow value still did not exceed one-half of the arrest point heat flow value. Comparing our heat flow engineering calculations and test results, apart from the fact that the calculation values for a small section on the back of the rear step were inclined to be high, the other places were comparatively uniform (Fig. 9), and because the influence of the rear step was eliminated in the calculations, the differences in the vicinity of the rear step can be predicted.

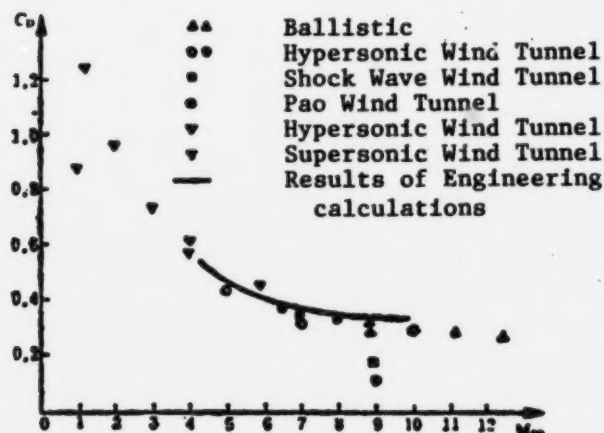


Fig. 7. Drag Coefficient of Recovery Body Under Sidewise Jettison- Drag Cone Scheme at Zero Angle of Attack With Changes in M_∞

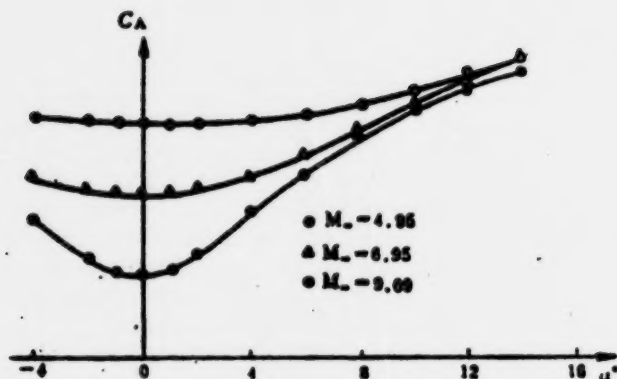


Fig. 8. Axial Force Coefficient of Recovery Body Under Sidewise Jettison- Drag Cone Scheme in Hypersonic Wind Tunnel With Changes in the Angle of Attack

IV. Aerodynamic Characteristics of the Towed Cone Scheme

The towed cone is the most typical of towed devices. The recovery body and the towed cone can be linked rigidly or flexibly. The most interesting problems of the aerodynamic characteristics of towed cones are the towed cone drag and stability. In the test results abroad^[5,6], the forebody was a pointed cone, and the test M number was rather low. The results obtained in measurements in transultrasonic^[19] and hypersonic wind tunnels^[20,21] are below:

1. The tests verified the concept of "critical distance." The tests showed that the critical distance was less than 3-fold the diameter of the bottom of the forebody. The tests also verified that the critical distance is inclined towards the front when the towed cone is shifted more to the front than to the back.
2. The tests showed that forebody purity and end erosion contour have a clear influence on towed cone drag. The greater the purity, the smaller the towed cone's drag (Fig. 10). When the purity ratio is 0.461, the end changes to 55° dual cones, and C_D drops 10 percent. The towed cone drag coefficient drops rather quickly with the M number (Fig. 11).
3. The tests showed that the drag coefficient in a towed cone forebody wake diminishes as the M number increases. The difference of the drag coefficient in an even flow and the drag coefficient in uneven flow of a towed cone increases as the M number increases. In an even flow field, the drag coefficient of a towed cone with 40° cone angle is smaller than when it is 30° , because in the former, an open separation flow appears (Fig. 4).
4. The Re number also has a definite influence on towed cone drag. In the hypersonic wind tunnel, when $M_\infty = 4$, the forechamber pressure increased from

2.5 atmospheres to 25 atmospheres, and when the corresponding Re number increased from $0.116 \times 10^8/\text{m}$ to $1.142 \times 10^8/\text{m}$, the drag coefficient increased 10 percent.

5. Rod and cable both made the towed cone drag coefficient decline compared to when there were no rod or cable and from the schlieren photographs it can be seen that separation shock waves appear on the rod and cable, thus causing the drag coefficient to drop.

6. The towed cone contour also has an influence on the drag coefficient. In the hypersonic wind tunnel, when $M_\infty = 5$, when the front step is eliminated, the drag coefficient increases from 0.457 to 0.50, and when the rear brake is eliminated, it drops to 0.43. When the towed cone angle is changed from 30° to 40° , the drag coefficient increases.

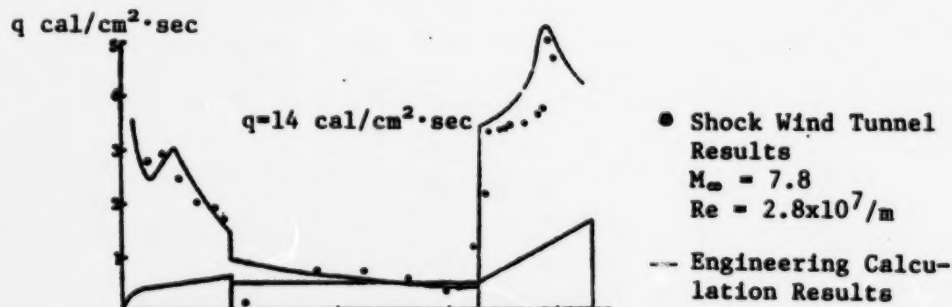


Fig. 9. Heat Flow Distribution of Recovery Body Under Sidewise Jettison- Drag Cone Scheme

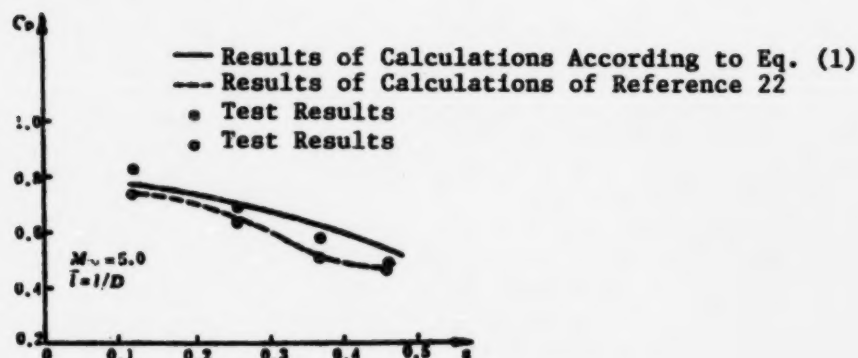


Fig. 10. Drag Coefficient of Towed Cone in Hypersonic Wind Tunnel With Changes in the Purity Ratio

Reference [22] supposes the wake neck position is 3-times the diameter of the bottom and that the neck width is 1/2 the bottom diameter, makes a straight line at the midpoint linking the shoulder and the neck width the backflow region boundary, then carries out the calculations according to the method of reference [23], the calculated dynamic pressure distribution is roughly the same as the experimental results abroad, as the distance from the bottom increases, the dynamic pressure peak increases, the peak position tends away from the axis, which is caused by the shock wave of the neck. The calculation results also show that the forebody purity ratio has a clear influence on the dynamic pressure cross-section, the pressure peak value of a large purity ratio is small and the peak value position tends further away from the axis. In addition, on the basis of reference [24] we feel that after it is larger than the critical distance, the wake velocity cross-section has similarities, combining the equations of reference [24] and [25], introducing the influence of the M number, we give the linked equations of the velocity cross-section:

$$\frac{V}{V_\infty} = 1 - A \left(\frac{X}{D} \right)^{-0.111} e^{B \left(\frac{X}{D} \right)^2} \quad (1)$$

$$A = 0.42 e^{(0.1114 M_\infty - \frac{1}{2} C_D)} \quad (2)$$

$$B = -7.89 e^{(-1.1114 C_D)} \quad (3)$$

in which D is the diameter of the forebody bottom, X is the axial distance starting from the bottom of the forebody, Y is the perpendicular distance from the central axis, and C_D is the forebody drag coefficient. After finding the dynamic pressure cross-section and the velocity cross-section, according to reference [26] we can use the revised Newton equation to calculate the towed cone drag. From Figures 10 and 11 it can be seen that good results can be obtained using the two above methods.

The towed cone stability tests in a hypersonic wind tunnel [20,21] showed that at the critical distance there is an unstable area, and this is identical to the results of references [5], [6], and [27]. These references also point out that farther distances which are greater than the critical distance, when the towed cone half cone angle increases to 45° or half cone angle 40° but the towed cone drag brake diameter is greater than 15 percent of the diameter when there is no drag brake, instability occurs. Reference [35] makes a preliminary dynamic analysis of the experimental results of the hypersonic wind tunnel.

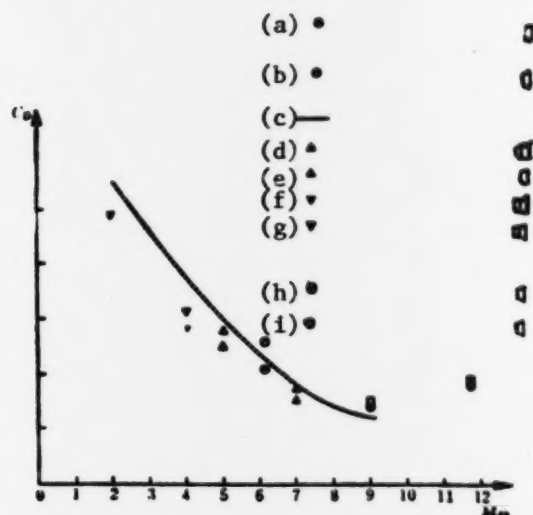
V. Aerodynamic Characteristics of the Drag Brake Scheme

Drag brakes are a commonly used means for increasing drag on flight vehicles. Wind tunnel tests show that when small wing surfaces are opened on the outer surface of a reentry vehicle, a rather large drag can be created and the number, position, shape, and size of the wings has a clear influence on drag. The scheme we researched consisted of four drag brakes extended on the bottom of the reentry vehicle, and the following results were obtained in hypersonic [28] and shock wave [29] wind tunnel tests.

1. Although there were major differences in the condition of the hypersonic and shock wave wind tunnels, the trend of the test results was uniform. The increased drag effect of the drag brakes increased as the angle of attack, zhejiao [2124 6037 fold angle?], drag brake surface area, and bottom surface area increase, and diminish as the M number (when not larger than the angle of attack) increase. The advantage of the drag brake scheme compared to other schemes is that under high M numbers there is still a high drag coefficient and under high M numbers, changes with the M number are rather gentle.
2. The purity of the recovery body has a clear influence on overall drag. Without drag brakes, the drag of the reentry vehicle increases as the purity ratio increases, but increase in the purity ratio makes the dynamic pressure and the M number of the drag brakes drop, thus there is a critical purity ratio, and at this time the overall drag is at its smallest (Fig. 12).
3. When the angle of attack approaches 0° or is small, the increase drag effect of increasing the height of the drag brakes is better than increasing the width. At this time the increased proportion of drag exceeds the proportion of drag brake surface increase, because it expands the scope of the high pressure area on the brake. For example, if $M_\infty = 7$, the purity ratio $\epsilon = 0.259$, the zhejiao $\delta = 45^\circ$, when the ratio of the drag brake area and the bottom area increases from 0.048 to 0.064 the zero angle of attack drag

coefficient increases from 0.3 to 0.437. However, after the angle of attack $\alpha \geq 4^\circ$, the effect of increasing the drag brake height and the effect of increasing the zhejiao, clearly dropped.

4. Changes in the erosion contour cause the drag coefficient to clearly drop: when the top is a 55° cone, M_∞ , the drag coefficient drops 7 percent.



Key:

- a. Hypersonic Wind Tunnel, Contour ($i=4.2$)
- b. Hypersonic Wind Tunnel, Contour ($i=3.8$)
- c. Results of Calculation According to Eq. (1)
- d. Hypersonic Wind Tunnel, Contour
- e. Hypersonic Wind Tunnel, Contour
- f. Hypersonic Wind Tunnel, Contour
- g. Transultrasonic Wind Tunnel, Contour ($i=3.5$)
- h. Shock Wave Wind Tunnel, Contour (free flight test)
- i. Shock Wave Wind Tunnel, Contour

Fig. 11. Towed Cone Drag Coefficient With Changes in M Number

Reference [30] supplied an engineering calculation method for the aerodynamic characteristics of the drag brake scheme, the influence of separation flow and entropy layer swallowing are taken into account in the calculations, the M number of the brake front and the dynamic pressure are corrected, but the influence of the three dimensional effect of the drag brake and the uneven flow field of the brake front were not taken into account. The calculation results of this method and the wind tunnel test results data basically conform (Fig. 12). For the hypersonic wind tunnel, the calculated critical purity ratio (about 0.38) and the test results are pretty much the same, but for the shock wind tunnel test situation, no critical purity ratio appeared in the calculated results.

Reference [31] studied the influence on the drag brake thermal environment and the changes in the drag brake erosion contours on the drag coefficient, and when the zhejiao is 45° and 60° , a high peak thermal flow appears on the brake. The shock wave wind tunnel tests [32] verified this conclusion. This may make the drag brake's windward side burp a cavity contour [33] and thus makes the drag coefficient drop rather more [34].

VI. Ballistic Analysis and Characteristics Comparison

For a typical reentry vehicle we carried out a ballistic analysis and characteristics comparison of each scheme. The geometric dimensions of each scheme were limited structurally. The ratio of the drag brake surface area and the bottom surface area in the drag brake scheme was 0.084. We found the drag coefficient of the schemes using wind tunnel test data smoothing and engineering calculations extrapolated to high M numbers (Fig. 13), for the prerecovery reentry vehicle's nonviscous drag coefficient we used the results of nonviscous value calculations, for friction drag and bottom drag we used the general experimental equation, and on this basis we carried out ballistic calculations for the schemes. What interested us in comparing characteristics was: 1. If a supersonic parachute was not used, the M number at an altitude of 2.5 km might be reduced to $m = 1.0$. 2. Landing velocity did not exceed 30 m/sec. 3. Change in the axial overload after reaching recovery altitude. 4. The dynamic when the parachute opened satisfied the demand that the parachute could open without destruction [2]. The time of the drag cone deployment was assumed to be 0, 0.5, and 1.0 seconds, respectively, the drag brakes were considered to have been opened to 54° once and first opened to 30° , with the reopening to 54° separated by 0.5 or 1.0 seconds.

The results of the calculations demonstrated that the aft jettison mass plus parachute scheme jettisoned 60 percent of the mass, and opening the parachute at $M_\infty = 2$, and recovery at an altitude of 7 km, the parachute drag coefficient of 1.0, could satisfy the demands of safe recovery, the maximum overload at the time of jettisoning weight was 142 kg, thus the advantages of this scheme are that it is simple, reliable, and the overload is small, the key problem is whether jettisoning this much weight is permitted in the design and structure of a supersonic parachute. For the drag cone scheme, let η be the ratio of the recovery body length and the length of the reentry vehicle, when $\eta = 0.864$, not jettisoning weight, beginning recovery only at 7 km can satisfy the demands, considering errors in the drag coefficient, only when $\eta = 1.0$ (not jettisoning weight) can the demands be satisfied. If it can be designed so that structurally at the time of jettisoning the length of the recovery body is reduced, frequently the increase in drag is not enough because the bottom area is too small and the purity ratio is increased. If $\eta = 0.53$, then the jettison weight is 50 percent, and cannot satisfy the demands. With the drag brake surface selected, under the drag brake scheme not jettisoning weight cannot satisfy the demands, $\eta = 0.864$, the time interval of the second brake opening is 1.0 seconds, only jettisoning 44 percent of the weight can satisfy the demands. For the sidewise jettison mass-drag cone scheme, if the recovery altitude is 7 km, jettisoning 30 percent of the weight can satisfy the demands, and had considerable

yuliang [5940 6852]. If 50 percent of the weight is jettisoned, the recovery altitude can be dropped to 4.5 km. Table 1 gives the typical data for each scheme for a recovery altitude of 7 km and jettisoning 50 percent of the weight:

Scheme	Sidewise Jettison	Towed Cone		Drag Brake		
		0.864	0.53	0.864		
t(sec)	0	0	0.5	0	0	1.0
$M_H=2.5$ km	0.217	0.220	0.221	1.320	0.268	0.536
$H_M=1.0$ km	4.320	4.502	4.146	2.254	3.522	2.775

For the drag brake scheme, opening the brakes twice could clearly reduce axial overload. When $\Delta t = 1.0$ seconds, the maximum overload could be reduced 1/3, but velocity performance also was clearly lowered, and when the towed cone was released, it did not have a large influence on overload. This result is identical to the conclusions of reference [7] when the recovery body is a pointed cone. Calculations show that rationally designed recovery altitude and jettison weight ratio, the schemes could satisfy the demands of open parachute dynamics so that after satisfying the demand of M_{∞} when $H = 2.5$ km, an ordinary parachute could satisfy the demands of landing velocity.

Actually, from Figure 13 it can be seen that as far as the drag coefficient of the several schemes is concerned, it is very difficult to come to any conclusion about which is best. However, as far as drag is concerned, another important factor is the diameter of the bottom. After jettisoning mass, the towed cone and drag brake schemes, are structurally arranged smaller than the bottom diameter of the sidewise jettison-drag cone scheme. For these two schemes, the structural problem of jettison weight has to be resolved, in addition, the problem of towed cone stability and drag brake thermal resistance are two aerodynamic problems which must also be resolved for these two schemes. At the same time, because the jettison weight and increased drag of these two schemes involved two actions, it increases the complexity of the control systems. For the sidewise jettison-drag cone scheme, jettison weight and increasing drag are carried out simultaneously by a single action, the demands on the control systems are reduced. However, for this scheme it is necessary to clarify the aerodynamic interference of the shell and the recovery body to avoid collision between the two bodies and excessive disturbance caused by the recovery body, if the reentry vehicle has a definite angle of attack before recovery, or if a nonsymmetrical separation occurs, the problem will be even more complex.

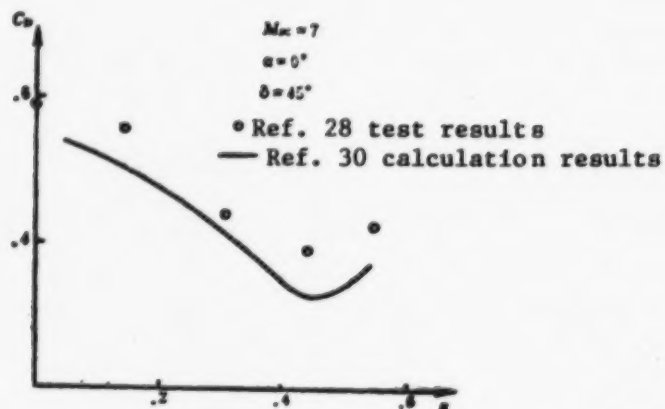


Fig. 12. Drag Coefficient of Drag Brake Scheme When $M_{\infty} = 7$ With Changes in the Purity Ratio

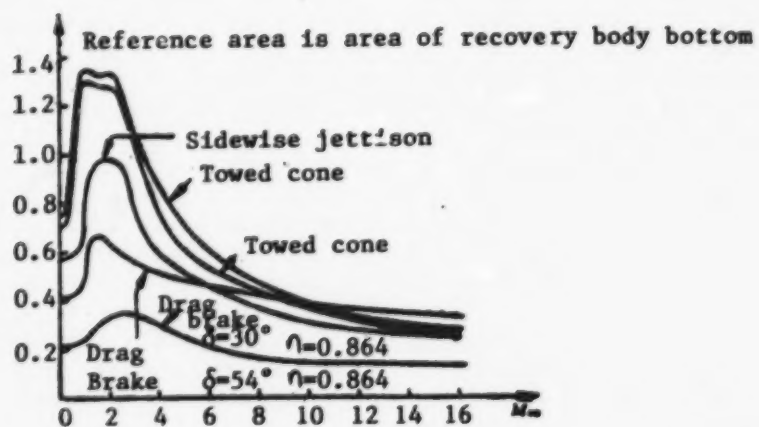


Fig. 13. Drag Coefficient Used in Ballistic Analysis of Each Scheme

VII. Conclusions and Proposals

1. Although the flow around the body of the recovery body in each of the recovery schemes has its own characteristics, all can produce open-type separation flow. If open-type separation flow appears on the recovery body, the drag coefficient clearly diminishes, and thus in design, the appearance of this type of flow should be avoided as much as possible.
2. At supersonic speeds, the drag coefficient of all the schemes drops with the M number, but the drag coefficient of the drag brake scheme drops comparatively gently with the M number. The drag coefficient of the schemes has a clear influence on the purity ratio of the recovery body. Changes in the duntou erosion contour also has a definite influence.
3. Ballistic analysis shows that the schemes can achieve similar deceleration effects. When choosing a scheme, the advantages and disadvantages of aerodynamics, structure, heat resistance, control, and demands on the parachute of each of the schemes should be weighed. Further research should be conducted on aerodynamic interference in the weight jettisoning process of the schemes.
4. After comprehensive analysis, the results of wind tunnel force, pressure, and heat measurement tests and free ballistic tests and the results of engineering calculations of these schemes can serve as a preliminary design basis. To obtain more reliable aerodynamic data, it is still necessary to improve the testing techniques for existing equipment, improve engineering calculation methods, research the numerical calculation methods of complex contour nonviscous and viscous flow, and at the same time create conditions for carrying out model free flight tests.

The relevant calculations of the comprehensive analysis in this paper were done by Comrades Zhang Xiaoli [1728 2556 7787], Xue Limin [5641 0448 3046], in the process of completing this paper we received the support of the Ministry of Aerospace Industry, the China Aerodynamic Research and Development Center, the Beijing Aerodynamic Research Institute, and the Chinese Academy of Sciences Dynamics Institute. Comrades Sun Yijun [1327 3015 0193], Cai Jinshi [5591 6855 3740], Wen Yongyuan [3306 8673 3293], Sun Hongsen [1327 3163 2773], Cao Wenxiang [2580 2429 4382], and Wang Jianli [3769 7003 5461] provided a great deal of help, and here we thank them as a group.

References

1. Rigali, D.J. and Sterk, M.W., AIAA, 80-1455 (1980)
2. English, E.A., SAND 76-8059 (1976)
3. Smith, D.H., AD-A066095 (1978)
4. Smith, D.H., AD-A066217 (1973)
5. Charczenko, N. and Moshera, J.T., NASA TND-994

6. Charczenko, N., NASA TND-1789
7. Sims, L.W., J.SPACECRAFT, 8, 5 (1971) 538-541
8. Steck, H.T., J. SPACECRAFT, 4, 6 (1968) 746-750
9. Platus, D.H., J. SPACECRAFT, 13, 3 (1970) 275-281
10. Platus, D.H., AIAA 80-1574 (1980)
11. Huang Zhicheng [7806 1807 3397], QIDONGLIXUE ZAZHI [AERODYNAMICS MAGAZINE] 4 (1984) 13-18
12. Charwat, A.F., et al., J. AEROSPACE/SCIENCES, 28, 7 (1961) 513-523
13. Xu Nengxi [6079 5174 0823], CEPAO-ZULICHI FANG'AN CHAOSHENGSHU FENG DONG SHIYAN BAOGAO [SIDEWISE JETTISON-DRAG CONE SCHEME SUPERSONIC WIND TUNNEL TEST REPORT], Internal Report (1982)
14. Chen Mo [7115 6206], CEPAO-ZULICHI FANG'AN GAOSHENGSHU FENG DONG SHIYAN BAOGAO [SIDEWISE JETTISON-DRAG CONE SCHEME HYPERSONIC WIND TUNNEL TEST REPORT], Internal Report (1982)
15. Yang Yuedong [2799 6460 2767], Wang Fu [3769 1788], Guo Dahua [6753 1129 5478], CEPAO-ZULICHUI MOXING QIDONGLI SHIYAN [SIDEWISE JETTISON-DRAG CONE MODEL AERODYNAMIC TESTS], Internal Report (1983)
16. Zhang Wanqing [1728 2519 3237], HUI SHOU FANG'AN WENDING HE ZULI TEXING JIBO GUANG DONG ZIYOU FEI SHIYAN [RECOVERY SCHEME STABILITY AND DRAG CHARACTERISTIC SHOCK TUBE TUNNEL FREE FLIGHT TESTS], Internal Report (1982)
17. Dong Wenlou [5516 2429 2869], ZU HETI MOXING DANDA OBA QIDONGLI SHIYAN [COMPOSITE BODY MODEL BALLISTIC AERODYNAMIC TESTS], Internal Report (1983)
18. Ericsson, L.E., AIAA 81-0076 (1981)
19. TOCHUI KUACHAOSHENGSHU FENG DONG CELI SHIYAN [TOWED CONE TRANSSUPERSONIC WIND TUNNEL MEASUREMENT TESTS], Internal Report (1982)
20. Zhou Congzhi [0719 1783 4160], TOCHUI GAOCHAOSHENGSHU FENG DONG CELI SHIYAN [TOWED CONE HYPERSONIC WIND TUNNEL MEASUREMENT TESTS], Internal Report (1982)
21. Chen Mo [7115 6206], TOCHUI FANG'AN CELI SHIYAN [TOWED CONE SCHEME MEASUREMENT TESTS], Internal Report (1982)
22. Cao Wenxiang [2580 2429 4382], WEILIU LIUCHANG JI JIECHUI ZULI GONGCHENG JISUAN FANGFA [WAKE AND TRUNCATED CONE DRAG ENGINEERING CALCULATION METHOD], Internal Report (1982)
23. Lin, T.C., et al., AIAA 79-153 (1979)

24. Cambell, J., and Grow, J.W., NASA TND-5365
25. Peterson, C.W., and Johnson, D.W., AIAA 81-1939 (1981)
26. Moore, F.G., DeJarnette, D.W., and Brooks, E.N., Jr., AIAA 70-1176 (1970)
27. Reding, J.P., and Ericsson, L.W., J. SPACECRAFT, 4, 4 (1967) 511-518
28. Xia Lian [1115 3425], HUISSHOUTI ZULIBAN FANG'AN CELI SHIYAN [RECOVERY BODY DRAG BRAKE SCHEME MEASUREMENT TESTS], Internal Report (1982)
29. Yang Yaodong [2799 5069 2767], Wang Fu [3769 1788], and Guo Dahua [6753 1129 5478], DAIYOU ZULIBANDE HUISSHOU MOSING ZAI $M_\infty = 7.8$ SHIDE ZULI CILIANG [MEASUREMENT OF DRAG OF A RECOVERY MODEL WITH DRAG BRAKES WHEN $M_\infty = 7.8$], Internal Report (1982)
30. Wen Yongyuan [3306 8673 3293], DAIFENLI KONGZHIBAN CHUNCHUI QIDONG TEXINGDE GONGCHENG JISUAN FANGFA [A METHOD OF ENGINEERING CALCULATIONS FOR THE AERODYNAMIC CHARACTERISTICS OF A PURE CONE WITH SEPARATION CONTROL PANEL] QIDONGLIXUE ZAZHI [AERODYNAMICS MAGAZINE], 1 (1984) 49-53
31. Berman, R., et al., J. SPACECRAFT 14, 3 (1977) 163-169
32. Gao Ruifeng [7559 3843 1496], KONGZHIYI GAOCHAOYINSU TUANLIU RELIU JI YALI TEXING SHIYAN YANJIU [EXPERIMENTAL RESEARCHES ON CONTROL WING HYPERSONIC TURBULENT HEAT FLOW AND PRESSURE CHARACTERISTICS], KONGQI DONGLIXUE XUEBAO [AERODYNAMIC JOURNAL], 4 (1984) 56-60
33. Han Yinda [7281 1377 6671], ZULIBAN JUBU SHAOSHI SHIYAN YANJIU [DRAG BRAKE PARTIAL EROSION EXPERIMENTAL RESEARCH], Internal Report (1982)
34. Wang Jianli [3769 7003 5461], KONGJIAO KONGZHI HUISSHOU FANG'AN GUJI [ESTIMATES OF ANGLE OF ATTACK CONTROL RECOVERY SCHEME], Internal Report (1982)
35. Ke Daiyun [0668 0108 0061], Cai Jinshi [5591 6855 3740], TOCHUI HUISSHOUTI DONGLIXUE TEXHING JISUAN [CALCULATIONS OF TOWED CONE RECOVERY BODY DYNAMIC CHARACTERISTICS], Internal Report (1982)

8226/13046

CSO: 4008/56

APPLIED SCIENCES

NEW TOOL MATERIAL TO PREVENT SPARKS, EXPLOSIONS

Beijing JINSHU RECHULI [HEAT TREATMENT OF METALS] in Chinese No 10, Oct 85
pp 59-62

[Article by Wang Funian [3769 4395 1628]: "New Materials' Tool Materials
for Preventing Sparks and Explosions"]

[Text] For a long time the places susceptible to combustion and explosions in the chemical, ordnance, automotive, petroleum, and other industries have all along continued to use repair tools made of iron. Under this condition during work, when operations are improper and striking occurs, sparks are easily generated leading to fires or explosions. Therefore there is very much of a need to study a new type of tool material that will prevent sparks and explosions. After more than a year of tests we have successfully developed a new type of tool material to prevent sparks and explosions; not only does it possess a rather high strength, hardness, and malleability, but its cost is also low.

1. Selection of Materials

Commonly used repair tools like adjustable wrenches, hand-held hammers, and various types of special-use wrenches for the most part use carbon steel in manufacturing. Their post-forging mechanical properties are 30 steel:

$\sigma_b \geq 57 \text{kgf/mm}^2$, HB229; 40 steel: $\sigma_b \geq 62 \text{kgf/mm}^2$, HB241; and 45 steel: $\sigma_b \geq 65 \text{kgf/mm}^2$,

HB241. When these tools strike they can generate sparks and cannot be used in places susceptible to combustion and explosions. According to document presentations, bronzing and aluminum bronze can satisfy this technical demand. However, the price of bronzing is expensive and cannot be easily employed for general-use repair tools. Based on document presentations, ZQAl 10-4-4

alloy-casting state properties are $\sigma_b 50-60 \text{kgf/mm}^2$, $\delta_b 5-10\%$, HB200; ZQAl 11-6-6

alloy mechanical properties are $\sigma_b 60-70 \text{kgf/mm}^2$, $\delta_5 1-2\%$, HB250. ZQAl 10-4-4

alloy strength is rather low and malleability is good. ZQAl 11-6-6 alloy strength is high and malleability deficient. We have referred to the alloy composition of the two above-mentioned and have selected Al, Fe, and Ni as the primary alloy elements, and to abate further the characteristic of aluminum bronze's slow-cooling brittleness and to enhance its strength and malleability

we have appropriately added a small quantity of manganese. The mechanical properties of aluminum bronze after it was improved were in the range of ZQAl 10-404 and ZQAl 11-6-6, and its physical chemistry properties corresponded to them. The mechanical properties of this kind of alloy during its casting state are $\sigma_b \geq 73 \text{ kgf/mm}^2$, $\delta_{10} 5-7\%$, HB 243-261, $a_h 2.5-3.5 \text{ kgf.m/cm}^2$, and $\tau_b 56 \text{ kgf/mm}^2$.

2. Smelting Characteristics

(1) Addition of alloy elements. When adding alloy elements it is necessary to stir so as to avoid generating segregation. When adding aluminum to the copper liquid a violent exothermic reaction can occur. To avoid the solution temperature from getting too high you can add while mixing.

(2) Casting. Repeated experiments have made clear that a metallic permanent-mould casting is much better than a sand mould casting. If the melting temperature of this kind of alloy is excessively high, coarse crystals will easily be generated. Under a normal casting temperature the metallographic organization of casting alloys consists of thin and well-distributed alpha and beta phases which approach small granular ferrous grains. See Figures 1a and 1b.



Figure 1. Metallographic Organization of Alloy Casting State x200.

(a) Metallic-mould casting (HB280) (b) Sand mould casting (HB240).

(3) Special points of congealing. The scope of this kind of alloy-crystallizing temperature is rather narrow. Its congealing characteristics approach pure metallic-layer congealing and the fluidity is good, but the volume contraction is great, which easily forms concentrated contraction cavities and does not easily form interdendritic segregation. Due to the fact that the aluminum content of the alloy is fairly high, Al_2O_3 inclusions are easily formed. This is especially so in the formed secondary oxides during the course of casting, which is very difficult to remove from the casting and seriously affects the quality of the casting. Therefore there should remain a sufficient rising head.

(4) Annealing brittleness. If the casting is improper, hard and brittle eutectoids ($\alpha + \gamma_2$) will easily be separated out in the organization. This is due to the fact that when the alloy is at 565°C there occur eutectoids which transform $\beta \neq \alpha + \gamma_2$, and the speed of transformation is rather fast. At the time when the casting wall is rather thick and the speed of cooling rather slow there is still greater beta phase breakdown, making the casting become brittle and presenting naphthalene state coarse-grain fractures. To prevent annealing brittleness and to allow the alloy organization to obtain thin and well-distributed alpha and beta-phase integral well-distributed grains and ferrous grains, after casting you should open the oven as early as possible and allow the casting to be placed in the air for cooling (it is best to open the oven at 500-600°C and immediately water-cool). Moreover, within the alloy it is appropriate to add amounts of Fe, Ni, and Al elements, which can concurrently enhance the alloy hardness and malleability.

3. Metallic Organization and Mechanical Properties

(1) Casting state. The metallic-phase organization of metallic mould-casting alloys is ($\sigma + \beta$) phase-integral small granular ferrous grains (see Figure 1a). Its mechanical properties are σ_b 78-88 kgf/mm², δ_{10} 4-10%, HB280, and a_h 5.6 kgf.m/cm².

The metallic organization and mechanical properties of sand mould casting alloy are $\alpha + \beta$ phase-integral small granular state ferrous grains (see Figure 1b). Its mechanical properties are σ_b 73-78 kgf/mm², δ_{10} 5-7%, HB243-261, a_h 2.5-3.5 kgf.m/cm², and τ_b 56 kgf/mm².

(2) Forging. This kind of alloy can undergo a hot forging processing. The temperature at the beginning of forging is 900-920°C, and the temperature at the end of forging is 650-750°C. After forging, the metallic-phase organization is even more thin and well distributed and it has improved upon the original casting state organization. The post-forging metallic-phase organization of sand mould-casting alloys is the granulated-state $\alpha + \beta$ phase of small granular ferrous particles (see Figure 2). Its mechanical properties are σ_b 79-88 kgf/mm², δ_{10} 3-7%, HB280-380, a_h 5.1 kgf.m/cm², and τ_b 73 kgf/mm².



Figure 2. Alloy Hot Post-Forging Metallic Organization of Sand Mould Casting (HB380) x500

(3) Heat treatment. By heating the alloy to 920°C, with heat preservation at 2h, and by tempering it by dipping it into water at 20-25°C, you will obtain a xiang steel-annealing martensite-state metastable β^1 phase organization. Under a microscope you will observe a β^1 phase which assumes a needle shape. If the β^1 phase is scattered and well dispersed and the quantity is appropriate you can enhance the alloy composite mechanical properties. But if the β^1 phase is too great and too coarse you will make the alloy become brittle. Therefore, this kind of alloy may employ heat treatment to improve its organization and performance (see Figures 3a and 3b). If the annealing organization is too hard and too brittle it will have no useful value and it must undergo heat preservation at 650°C 2-3h and return to the fire for treatment before it can be used.

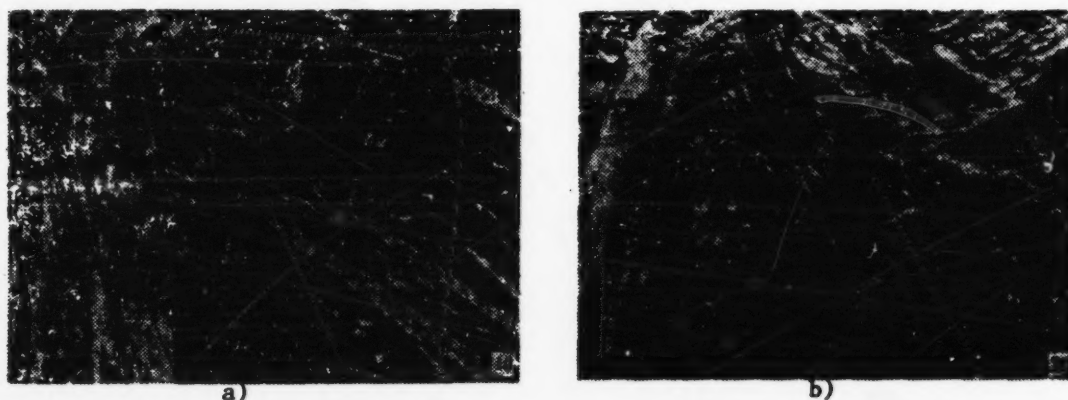


Figure 3. Metallic Organization of Alloys After Tempering x200. a) Metallic organization of (HB320) sand mould casts after tempering. b) Metallic organization of (HB354) metallic-mould casts after tempering.

After sand mould castings are tempered you can obtain a needle state $\beta^1 + \alpha$ organization and small granular Fe particles (see Figure 3a). The metallic-phase organization at 650°C after being returned to the fire is still the $\alpha + \beta$ phase and small granular Fe particles. However, it is finer than the casting state organization (see Figure 4a). Its mechanical properties are a hardness at HB323-340 after being tempered by dipping in water. After return fire treatment at 650°C it is HB225, $\alpha_h 5.6 \text{ kgf.m/cm}^2$.

The organization of post-alloy heat treatment by using metallic-mould castings is the same (see Figure 3b and Figure 4b). Its hardness of HB353 is the hardness of HB261 after returning to the fire at 650°C. The metallic-phase organization of metallic-mould casting alloys after they have undergone additional heat to 950°C has been tempered by dipping into water, and after being returned to the fire at 650°C it is much finer than sand mould castings. That alloy also may after maintaining a temperature of 650°C at 2-3h be directly tempered by dipping into water. In this way you can obtain the organization of xiang steel's hodograph physical state. Because there is no phase change there is no brittle phase. You need not undergo tempering treatment and its hardness is HB267 (see Figures 5a and 5b).

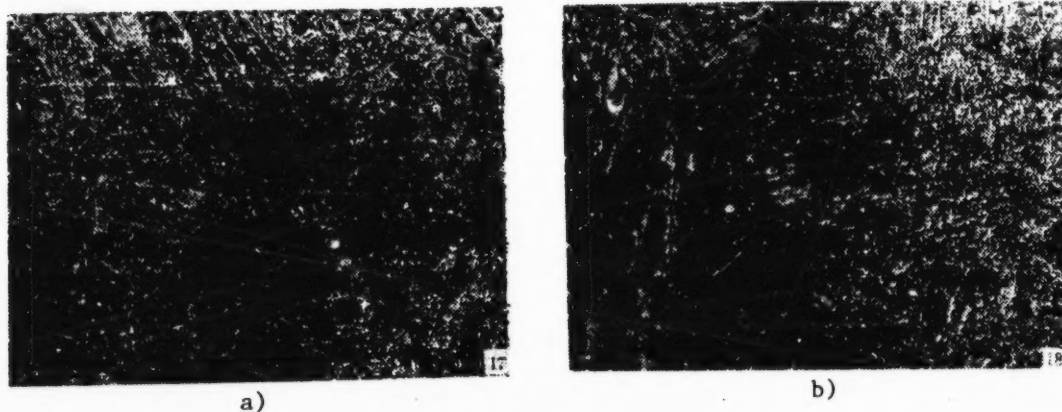


Figure 4. Metallic Organization of Alloys After Tempering by Returning to the Fire x 500. a) Sand mould casting tempering and metallic organization of (HB245) after returning to the fire. b) Metallic-mould casting tempering and metallic organization of (HB267) after returning to the fire.

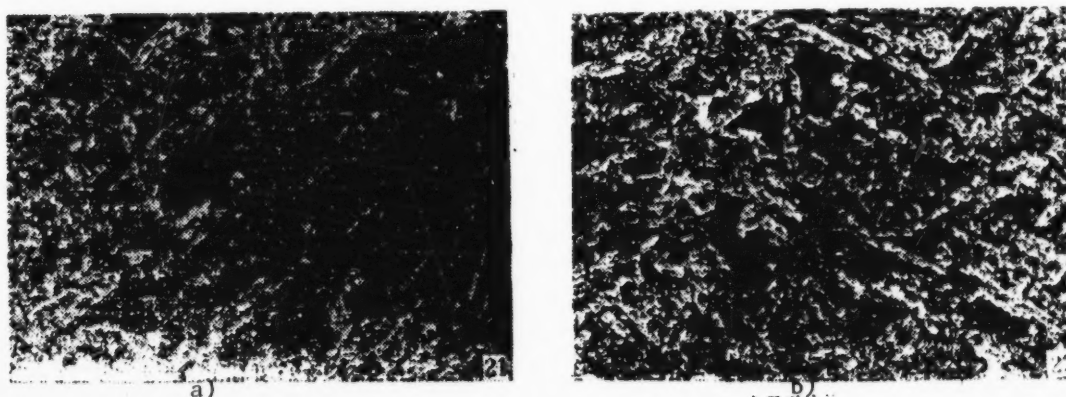


Figure 5. Organization of Alloys Undergoing Tempering at 650°C and Not Being Returned to Fire x 500. a) Sand mould casting (HB245). b) Metallic-mould casting (HB726).

Although the hardness of this kind of steel does not decrease much after undergoing water quenching at 650°C, after treatment the metallic-phase organization is much finer than the casting-state organization and its composite properties also have obviously been enhanced.

4. Applications and Existing Problems

(1) Under any condition this kind of alloy will not generate sparks when struck and it has sufficiently high strength, hardness, and malleability in order to be manufactured as an appropriately utilized repair tool such as hand-held hammers, adjustable wrenches, special-use wrenches, screwdrivers, etc. in places susceptible to combustion and explosions. After more than 1 year of being put into production the use effect has been good and they are completely safe and reliable.

(2) This kind of alloy has comparatively high strength, hardness, wearability, and good technological properties and corrosion resistance. Moreover, under temperatures of 500°C these properties may be maintained. Therefore they may also be used as wearproof, corrosion-resistant spare parts under conditions of high temperature and pressure.

(3) This kind of alloys' shrinkage is great. Therefore during forging you must leave sufficiently large casting heads before you can maintain the quality of the product.

BIBLIOGRAPHY

1. D. Duerjin [phonetic], et al., translated by Wu Yunshu [0702 0061 2579], Tang Disheng [0781 2769 3932], et al., "The Organization and Properties of Nonferrous Metals and Alloys," 1957.
2. L. Emilieer [phonetic], translated by Zi Qun [1311 5028], Liu Xin [0491 2946], et al., "Processing Handbook of Nonferrous Metals and Alloys," 1956.
3. "Metallic-phase Tests," published by the editorial department of the Shanghai Materials Research Institute Physical Chemistry Laboratory.

12670/7358

CSO: 4008/1037

URBAN, RURAL ENVIRONMENTAL WORK FOR 1986 OUTLINED

Beijing JIANZHU [BUILDING CONSTRUCTION] in Chinese No 2, 7 Feb 86 pp 8-10

[Article: "Urban and Rural Construction and Environmental Protection Work in 1986"]

[Text] Urban and Rural Construction and Environmental Protection Vice Minister Comrade Lilan Zhong [1670 0112], at a meeting with the national construction commissioner and the director of the construction committee on 18 December 1985, outlined the work ahead for 1986. He pointed out that 1986 being the first year of the Seventh 5-year Plan, we want, on the basis of the success achieved by the Sixth 5-year plan, to grasp reform, establish confidence, overcome difficulties, forge ahead positively, and raise every aspect of work to a new level.

1. Strive to Enhance Economic and Social Benefits of the Construction Industry

In 1986, the central responsibilities of the construction profession are: deep organizational reforms, consolidation of the construction market, improvement in the style of management, assurance of engineering quality, and improvement of economic and social benefits.

Regarding deep system reforms, the main thing is to continue to pursue contracts through public bidding; this is the most important reform measure and should be carried to completion. From now on, new engineering projects in general must implement public bidding of contracts. Those which still do not meet this requirement must break down the barriers and the monopolistic situation and positively create the conditions for this reform. Responsible departments of urban and rural construction of all levels must strengthen the management work dealing with both the solicitation and submission of bids. Together with other concerned departments, they must earnestly examine the bidding organization, reasonably judge and decide bids, guard against lopsided pressure to give preference on the basis of the low bid alone, insist on equality among bidders, and be fair in judging bids and reasonable in deciding upon bids.

One successful change is the realization that responsibility for a job is contained in the value of production wages; we must insist on perfection. The key to perfection is to be in accord with advanced principles: a more equitable setting of the wage coefficient and the figuring of the rate of progress, engineering costs, and so forth into the value of production wages,

both of which we should consider as substantial engineering factors. We especially want to raise engineering quality. But the situation of increasing material costs and higher wages makes these goals unreasonable; we must eliminate this situation. We must also insist on the use of system reforms in labor. In the long run, extensive use of rural construction brigades and the establishment of a cooperative system of urban and rural contingents are suitable for our country's conditions and our strategy of reform measures. From now on, we must concentrate on solving these problems. First, we must use perfected methods; some use a combination of fixed-salary labor and contract and temporary labor and use either this division of labor or assign work independently to rural construction brigades. Second, we must raise the wages and benefits of contract and temporary workers. Third, the unit handling the job must strengthen the management of contract workers, temporary workers, and rural construction brigades.

We want to carry out and perfect every aspect of economic responsibility. From now on, pay attention to perfecting, completing, and publicizing our work. Chongqing's municipal building code task and the management of the contractors and the contract system in Shenyang City have been relatively successful; this has been an experience of widespread significance. Its central theme is to use a small basis to figure units, to separate the authority for the means of production from the management authority, to carry out collectivist group contracts, and to allow teams to figure profit and loss and adhere to labor distribution and democratic management.

We must promote creativity. Of central importance is to raise quality; we must advance and pay attention to design changes. Right now, we need to pay attention to the correct handling of good quality and quantity and the connection between speed and benefit; we insist that the priority is to improve the quality of design; we must advance and be actively involved with creative construction; and we must speed up the replacement of the old with newer products. Distribution systems must be beneficial in raising design quality as well as advantageous in raising comprehensive benefits and the level of creativity. Right now, a few design units seek production value and income whole totally ignoring quality in their methods; they should quickly change their attitude. We must do investigations and research to solve our spare-time design problem; we can use the contract directives and plans discussed above to get from the unit the correct amount and agree of organization needed to carry out spare-time design. The individual can then be given the appropriate remuneration.

A priority activity in 1986 must be adjustment to the construction market and a conscientious effort to deal with present urgent problems to advance cadre, market, and professional management. (1) In adjusting the construction market, we must, in the beginning, insist on the elimination of illegal activity such as unlicensed designers, unlicensed construction workers, the taking on of work by underqualified people, fraudulent practices, misrepresentation of professional qualifications, etc. If these things cannot be accomplished, the confused situation in the market will be impossible to change. Those responsible for checking qualifications have not done a good job in this area and they must grasp this opportunity to perfect this business. The responsible

department will soon establish a method related to checking the qualifications for the construction of factory components and the construction of individual houses. After everyone receives it, they should rapidly arrange for its implementation. (2) Regarding all kinds of bad elements and swindlers who profit from this kind of illegal activity, we must dare to have them arrested and handle the investigation. (3) We must strengthen the management of urban and rural construction ranks. Regarding the assignment of rural construction teams coming into the city under contract, we must be careful about registration, check out qualifications, contract the task, and stress safety education and every aspect of quality control; we want to manage all this in a united way through the municipal jurisdiction. Regarding contract tasks of urban construction ranks throughout the province, we must get evidence of the quality of those going outside the district and do a thorough investigation of those coming into the district. (4) We must strengthen professional management. The key cities we want to publicize are Chongqing, Nanjing, Nanchang, Shenyang, etc., particularly in the areas of organization of city management and their experience with united management in the construction industry. The top offices in the country should also strengthen professional management and, based on the existing organizational personnel, adjust and set up the management of the administrative organizations for all professions. (5) We must perfect industrial management. We want to carry out modernization positively and adopt scientific management ideas, organization, methods, and measures. We want to put into play highly efficient management, create the greatest benefit, and conscientiously act upon improvements in industrial management.

In regard to raising the quality of engineering, we certainly want outstanding results in 1986. We must pay attention to these three things: first, we must correct the guiding ideology of industrial management. We must raise engineering quality and place it in an outstanding position. We must insist on precise work, good work, and fast work, and we must be thrifty. Second, we must set up a perfect engineering quality control organization. Supervisory stations of all levels must seriously carry out their duty, strictly carry out the law, and be genuinely effective. Third, we must have a system of quality assurance in industrial internal departments, thoroughly educate and develop quality awareness, and form a strong basis for improvement to raise engineering quality continuously. From company managers and technical offices to production teams, we must all build many administrative levels of a responsible system which will clearly reward and punish. In judging engineering quality, we must adhere to nationally issued technical regulations and standards for guidance; all engineers must establish technical files and also assure that technical information is correct. Basic engineering materials, components, and products must be examined and receive a certificate of suitability before leaving the factory; if one does not have that certificate, then the item must be reexamined until it passes. Unsuitable engineering quality cannot be reported on a schedule nor can it be considered as finished work and figured into the production value; it must be returned and the work redone.

2. Vigorously Pursue the Urban Program, Construction and Management Work

In 1986, we want to center on the urban capability to develop central motivation and diversified functionality better, continue to pay attention to the formulation and implementation of the urban program, organize reform of the urban construction system, grasp solutions to certain urgent urban problems, positively pursue each efficacious economic policy of urban construction, quicken the pace of residential commodity spending, set up reform experimental point for housing systems, and raise the urban program, construction, and management work to a new level.

Central to wanting to pursue residential commodity spending is a sense of conscientiousness about city and town residential construction and real estate management and administration work. First, we must pursue residential commodity spending and reform the housing system. Second, we must continue to grasp the policy of implementing private savings. Third, we must pay special attention to the nationwide urban and rural housing survey. Fourth, we must strengthen the real estate market and real estate industry management. Real estate management departments of all levels must bring governmental functions into full play, implement government/industry separation, reform the system of government/industry interaction in management, be geared to the needs of all industry, and vigorously enact the real estate development program, policies, legislation, organization coordination, etc.

3. Important Points on Construction in Market Towns; Pay Special attention to the Village and Town Construction Program and Design Work

Concerning village and town construction work, of importance are these types of considerations: first, we want to base the previously drawn-up village and town program on economics, carry on supplemental adjustments of social development requirements, and proceed deeper and in more detail to the formulation of a construction program. Second, we must strengthen program management, incorporate beneficial control over land for peasant home building, work out control criteria for use by rural town enterprises, and firmly redress the phenomenon of the rural-town industrial takeover of farmland. Third, the three levels of province, district, and county must layer upon layer pay close attention to the unified program for market towns, engage in comprehensive development experiments, obtain experience, and progressively publicize. Fourth, we must vigorously raise the level of architectural design in villages and towns of all types. We especially want to provide diversified styles of peasant residential designs which conform to local characteristics.

4. Important Points Regarding Comprehensive Renovation of the Urban Environment; Bring into Play the Whole Environment Protection Department, Supervise Activity, and Strengthen Environmental Management

Regarding new construction, reconstruction, expansion projects, etc., we want to step ahead and strengthen environmental supervision management. Large and mid-size projects should strive for 90 percent simultaneous achievement in these three areas; small projects should strive for over 60 percent absence of pollution or for a low level of pollution. In developing the coastal cities

and other economically important areas, we want to be especially careful in dealing with environmental protection and create a favorable environment for investment.

Regarding rural enterprise, we want to propagate vigorously and carry out general and specific policies concerning the prevention and control of pollution.

5. Carry Out Thorough Reform of Drafting and Surveying Systems; Expand Scope of Drafting and Surveying Services

All levels of departments responsible for drafting and surveying must realistically strengthen their macroscopic direction and adhere to the management system. Pay attention to all facets of formulating reform measures. Use the connection between the bidding system and economic reform to break through, fix new drafting and surveying production quotas, and formulate a set of drafting and surveying product prices. We should prepare for construction with a file network for storage of drafting and surveying materials nationwide. Regarding the expanded scope of service, an important point is to carry out land survey experiments, summarize the experience, formulate land survey technology standards and criteria, and, moreover, provide all the required technological equipment for an expanded scope of services.

6. Step Forward and Strengthen Legislative Work

In 1986, we want to promulgate several laws and regulations. For example, the "installation of a national unified architectural labor quota" and that of a "national unified municipal engineering labor quota" are two types of quota-related administrative methods we hope to attain. We should strive to work to completion and also report on laws and regulations. Pay attention to rough drafts of amendments to laws and regulations. At the same time, we do not want 1986 to be a year of investigation and research. We should strive to advance a clear, integrated, and systematic program of urban and rural construction and environmental protection laws and regulations.

7. Pay Close Attention to System Reforms in Science and Technology; Improve Level of Technological Equipment for Every Profession

An important point in regard to science and technology system reform is the reform of the management methods of annual planning. We must establish a science and technology development fund and solve the problem of inequitable distribution of income among research units. Research workers must pay close attention to the task of satisfying the urgent requirements of construction and environmental protection, organization of power, and development of strategy. We especially want to pay attention to the timely, publicized, and responsive achievements we have already made in scientific research. Moreover, we must energetically and reliably develop cooperation and communication with foreign science and technology groups.

8. Pay Attention to Development of Education; Train Person, Then He Can Work

There are three aspects of this work which we want to do well. First, we must pay attention to secondary technical education and make adjustments in

the structure of secondary and higher technical education. Current secondary schools must expand their scope. Provinces which have not built municipal secondary technical schools must prepare to do so and quickly realize the "two schools per province" pattern. In places where conditions permit, we still want to prepare for the construction of secondary technical schools in villages and towns. My department and the Central Radio and Television University have cooperated in three locally built secondary technical schools of television which will soon be open for registration. Each district and each unit must strive to do the registration work for the secondary technical schools of television. We must energetically take care of secondary technical correspondence schools, workers secondary technical schools, workers schools, and secondary technical self-study examinations. We must utilize many types of communication channels and train mid-level, technically capable workers. Second, we must progressively set up a standard system of assuring workers' training. In 1986, we must continue to pay close attention to the preparatory construction by my department of a cadre management institute. We also must, one by one, formulate professional standards, relevant educational programs, educational outlines, and educational materials for all levels and all types of cadre positions. Third, we must continue to reform the hiring system and strictly implement the "first train, then work" rule. Fourth, under the premise of quality assurance, we must have a sustained, steady development of directly subordinate, higher education facilities.

9. Vigorously Strengthen Spirit, Culture, and Construction; Perform Well on Political and Ideological Work

Regarding our paying attention to spirit, culture, and construction and the central theme of strengthening political and ideological work, we must strive for awareness of both the party's and society's mood for a basic change for the better. All levels of party work groups must directly face the present problems, and take care of the policies, ideals, regulations, legislation, and moral education of the workers. At the same time, all professions together must carry out reforms in the ideological direction and education of management work style education to make workers more self-disciplined, oppose all dishonest practices and the decadent management attitude that profit comes before anything, and resist and fight against the "money is everything" mentality and the self-centered, not group-centered, behavior which is not concerned for, and may even hurt, national interests.

13226/7051
CSO: 4008/53

PROMOTION OF HYDROPOWER STATION OUTPUT AND RECEPTION OF GENERATOR LOSSES BY
USING HEAT-PUMP AND REFRIGERATION SYSTEM

Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS]
in Chinese Vol 6 No 2, May 85 pp 117-120

[English abstract of article by Zhong Shiming [6988 0670 2494] of Nanjing
Institute of Technology]

[Text] This paper discusses the use of HPRS to raise hydropower station output and to receive generator losses, which is an effective measure. Analysis of three HPRS's developed by the author shows that the primary source cost-exergy efficiency when the air compressor HPRS approach is used is less than that of the boiler space heating approach, but by using the F-12 steam compressor HPRS, the efficiency is the highest, 5.2 times higher than that of the boiler space heating approach and 4.5 times higher than that of the air regenerative compressor HPRS.

QUASI-THREE-DIMENSIONAL DESIGN AND FULL THREE-DIMENSIONAL ANALYSIS CALCULATIONS
IN TURBOMACHINES

Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS]
in Chinese Vol 6 No 2, May 85 pp 125-129

[English abstract of article by Wang Qinghuan [3076 1987 2719] and Zhu Genxing [2612 2704 5281], et al., of the Institute of Engineering Thermophysics, Chinese Academy of Sciences]

[Text] Progress in the development of quasi-three-dimensional and full three-dimensional numerical solutions for steady subsonic rotational flow through turbomachines is presented. An iterative calculation between the flow on a mean hub-to-tip S_2 stream surface and a number of blade-to-blade S_1 stream surfaces gives the quasi-three-dimensional solution, which is very easily extended to give a full three-dimensional solution by merely calculating a few more S_2 surface flows and relaxing the restriction that S_1 surfaces are surfaces of revolution. A new S_2 - S_1 iteration scheme has been developed and employed in the present code. An automatic computing system is used, which first computes the quasi-three-dimensional flow for blade design and then computes the full three-dimensional flow for the blade row just designed.

The results obtained by applying this computing system to the design and determination of the full three-dimensional flow field of a two-stage axial compressor and a high subsonic compressor stator are obtained and show the difference in the flow field between the quasi-three-dimensional and full three-dimensional solutions.

EXPERIMENTAL RESEARCH ON SECONDARY FLOW IN RECTILINEAR TURBINE CASCADES

Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS]
in Chinese Vol 6 No 2, May 85 pp 130-135

[English abstract of article by Ye Dajun [0673 1129 0971], et al., of
Qinghua University]

[Text] In order to study the secondary flow in a turbine cascade the flow field is measured in detail. The measurements of pressure and velocity are taken at various axial planes upstream of, within, and downstream of the cascade by a four-hole probe. The static pressures are taken on the endwall and suction and pressure surfaces. Through experimental data, the mechanism of the secondary flow field and the loss model are proposed in this paper.

THE OSCILLATING MEAN STREAM LINE METHOD TO DETERMINE UNSTEADY FLOW ABOUT
VIBRATING CASCADE

Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS]
in Chinese Vol 6 No 2, May 85 pp 145-147

[English abstract of article by Chen Zuoyi [7115 0146 0001], Duan Qiusheng
[3008 4428 3932], Duan Shizhong [3008 0013 1813] and Zhu Zhiguo [2612 3112
0948] of Qinghua University]

[Text] In this article we expand the idea of mean stream line to determine the unsteady flow about the vibrating cascade. The physical model of the oscillating stream line and the "Oscillating Mean Stream Line Method" are presented. Based on the unsteady energy equation, the variation law of oscillating parameters along the mean stream line can be determined, and that along the pitch can be determined from the unsteady mass conservation, irrotational and boundary conditions. Thus we have obtained the unsteady flow solution about a vibrating cascade.

**EFFECT OF DIRECT HEATING ON COMBUSTION EFFICIENCY OF JET ENGINE CHAMBER IN
SIMULATION TEST ON THE GROUND**

Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS]
in Chinese Vol 6 No 2, May 85 pp 187-190

[English abstract of article by Yu Shouzhi [0060 1343 1807] and Lin Guohua
[2651 0948 5478], et al., of Beijing Power Plant Research Laboratory]

[Text] A calculation method of the combustion efficiency from a theoretical model has been developed to show the effect of direct heating, which produces pollutants in pure air, on the combustion efficiency of a jet engine combustor. This theoretical equation is proven using a large number of experimental data from models of conduct combustors and main combustors of jet engines and from the testing combustor. The equation of semiexperience for engineering, which can calculate the efficiency of combustion in the case of pure air from the experimental results for different polluting conditions, has been obtained.

9717

CSO: 4009/69

CALCULATION OF EXTERNAL AND INTERNAL TRANSONIC FLOW FIELD OF THREE-DIMENSIONAL S-SHAPED INLET

Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS]
in Chinese Vol 6 No 4, Nov 85 pp 321-325

[English abstract of article by Ji Minggang [4764 0682 0474], et al., of
Northwestern Polytechnic University]

[Text] A mixed finite difference method for calculating the external and internal transonic flow field around an s-shaped inlet is presented. The equation of the full velocity potential in cartesian or cylindrical coordinates is used as the governing equation. As the method used for the present analysis separates the coordinate system and the geometry, the mesh points may not lie on the body surface. The boundary condition is satisfied by the mesh points which are situated in the vicinity of the wall. An improved analytical continuation method is developed to treat the boundary condition at solid face. A linear under-relaxation procedure is used in calculations. The relaxation process is marched forward axially from one part to another in sequential order. The calculations are repeated until the change in the velocity potential between relaxation sweeps is less than a preassigned value and the conservation of mass flow between cross sections in the inlet is reached.

Computations have been made for an s-shaped inlet with free stream Mach number $M = 0.8$ at different angles of attack and yaw. The computed results are compared with those computed by the perturbation method and with experimental results. This comparison shows that the present method is promising.

DESIGN IMPROVEMENT AND TEST RESEARCH OF CENTRIFUGAL PUMP

Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS]
in Chinese Vol 6 No 4, Nov 85 pp 326-330

[English abstract of article by Liu Diankui [0491 3013 7608], et al., of the
Institute of Engineering Thermophysics, Chinese Academy of Sciences]

[Text] Based on Professor Wu's three-dimensional flow theory, the design improvement of a pipe inline pump has been done for the first time. The test results are as follows: the efficiency of the pump increases from 68.5 percent to 72.9 percent at design capacity and the best efficiency of the redesigned pump is about 75 percent. It is proven that the three-dimensional flow theory has great potential for improving pump design.

FINITE VOLUME METHOD TO SOLVE INVERSE PROBLEM FOR TRANSONIC FLOWS IN CASCADES

Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS]
in Chinese Vol 6 No 4, Nov 85 pp 331-335

[English abstract of article by Zhou Xinhai [0719 2450 3189], et al., of
Northwestern Polytechnic University]

[Text] A finite volume method to solve the inverse problem for transonic flows in cascades is described in this paper. This technique can be used to design the blade profile with prescribed pressure distribution at the blade wall. The paper presents the system of equations to be solved and the discretization scheme. The approach to modify the profile shape, calculation of the wall pressure and solution procedure is discussed in some detail. Some computed results of transonic turbine cascades are presented to illustrate the method's capabilities.

IMMERSION COOLING AND JET IMPINGEMENT COOLING OF MICROELECTRONIC CHIPS

Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS]
in Chinese Vol 6 No 4, Nov 85 pp 355-360

[English abstract of article by Ma Chongfang [7456 6850 5364] of Beijing
Polytechnic University]

[Text] An experimental apparatus for studying chip cooling was developed and is described. The fundamental characteristics of immersion cooling and jet impingement cooling have been investigated. Natural convection, pool boiling and impingement heat transfer with and without boiling and burn-out were the heat transmission modes encountered in the cooling techniques. It was found that the free convection heat transfer coefficients for a chip-size heater were as high as four times the predicted values. A new hysteresis phenomenon, never before presented in the literature, was discovered. For jet impingement cooling, initial, partial and fully-developed nucleate boiling and burn-out were studied experimentally. Some practical formulae are recommended for cooling system design.

RESEARCH ON NATURAL CONVECTION BETWEEN HORIZONTAL CONCENTRIC CYLINDERS WITH
ADDED MATERIALS

Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS]
in Chinese Vol 6 No 4, Nov 85 pp 370-372

[English abstract of article by Jiang Yu [1203 3842], et al., of the University
of Science and Technology of China, Hefei]

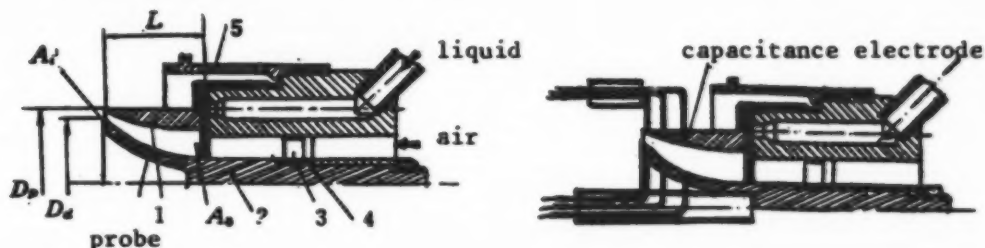
[Text] In this work a study of laminar natural convection in the horizontal annulus with added solid materials has been done by both computational and experimental methods. The theoretical temperature and velocity distributions are presented. The fluid temperature field is also obtained by holographic interferometry. The experimental results were in good agreement with those calculated by the numerical technique. This proved that both experimental and numerical methods are appropriate for studying this kind of problem. Results reported in this work can be used for thermal insulation techniques using air as an insulation material.

STUDY OF LIQUID FILM THICKNESS INSIDE AIRBLAST ATOMIZERS

Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS]
in Chinese Vol 6 No 4, Nov 85 pp 378-384

[English abstract of article by Zhao Qishou [6392 0366 1108], et al., of
Beijing Institute of Aeronautics and Astronautics]

[Text] The performance of liquid film thickness has been research theoretically and experimentally. A theoretical formula of film thickness of the liquid inside the atomizer was derived by thin shear layer equations. As a consequence, the key parameters dominating the film thickness h , especially the parameters of atomizer geometry, were found. From experiments an empirical formula for h was determined and it was found that the theory of film thickness agreed with the experimental results better. Some other factors, such as the initial amount of liquid swirl and airstream swirl in the atomizer, were also investigated.



STUDY OF CHARACTERISTICS OF BUBBLE IN FLUIDIZED BED COMBUSTOR

Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS]
in Chinese Vol 6 No 4, Nov 85 pp 385-388

[English abstract of article by Hong Yanhua [3163 3601 5478] of Zhejiang
Energy Institute; Chen Jiong [7115 3518] and Zhang Xuehong [1728 1331 1347],
et al., of Zhejiang University]

[Text] A fluidized bed combustor uses coal with broad size distribution as
fuel and operates at high temperatures. However, there is a dearth of
information concerning bubble properties under such conditions.

Based on the theoretical pressure field around a bubble in the fluidized bed
derived by Davidson, we have developed a new pair of pressure probes located
on common vertical axes to measure the bubble parameters: bubble rising
velocity, bubble depth (diameter), bubbling frequency, etc. The pressure
fluctuation signals received from a cold model and a combustor have been
analyzed by statistical methods with the help of a computer. Correlation of
the bubble parameters to solid properties and flow conditions by linear
regression analysis results in the empirical equations. The results show
that there is a great difference between bubble parameters in the cold model
and a real combustor.

9717

CSO: 4009/70

STUDY OF PROPERTIES OF CHINESE LARGE BGO CRYSTALS AS MATERIAL FOR ELECTRO-MAGNETIC CALORIMETRY

Beijing GAONENG WULI YU HE WULI [PHYSICA ENERGIAE FORTIS ET PHYSICA NUCLEARIS] in Chinese Vol 10 No 1, Jan 86 pp 1-8

[English abstract of article by Gu Yifan [7357 0110 5672] and Zhu Guoyi [2612 0948 5030], et al., of the Institute of High Energy Physics, Chinese Academy of Sciences; and Shen Dingzhong [3088 1353 0022], et al., of Shanghai Institute of Ceramics, Chinese Academy of Sciences]

[Text] Preliminary results on the properties of Chinese long BGO crystals for detection of photons are presented. Twenty-nine crystal samples grown by the Bridgman-Stockbarger method are superior overall to foreign products of similar size in energy resolution, light output and quality stability. The light output uniformity along the crystal length reaches a level of ± 1 percent. Various wrapping conditions are compared and geometric effects are studied.

RESEARCH FOR THE POSSIBILITY OF ACOUSTICALLY DETECTING COSMIC RAY PARTICLES

Beijing GAONENG WULI YU HE WULI [PHYSICA ENERGIAE FORTIS ET PHYSICA NUCLEARIS]
in Chinese Vol 10 No 1, Jan 86 pp 9-14

[English abstract of article by Jiang Yinlin [1203 0603 3829], et al., of the
Institute of High Energy Physics, Chinese Academy of Sciences; and Song Jian-
ning [1345 1696 1337] of the Institute of Acoustics, Chinese Academy of
Sciences]

[Text] Results of experiments exploring the possibility of acoustically
detecting cosmic ray particles are reported. It is shown that the ultrasonic
background noise is very complicated, and some individual and transient
ultrasonic signals exist in natural waters. The mechanism producing these
signals may be the sound radiation of the microbubbles in the water. There
is no evidence supporting the possible correlation between these signals and
cosmic ray particles. The threshold energy of acoustic detection of EAS core
is above $3 \cdot 10^{16}$ eV at sea level and that of the local showers produced by
cosmic ray particles is above 10^{14} eV.

ON THE BOUNDARY CONDITION AND CANONICAL S-WAVE HAMILTONIAN FOR THE DYON-FERMION SYSTEM--THE SURFACE LAGRANGIAN AND GAUGE INVARIANT CHARGE CURRENT

Beijing GAONENG WULI YU HE WULI [PHYSICA ENERGIAE FORTIS ET PHYSICA NUCLEARIS] in Chinese Vol 10 No 1, Jan 86 pp 15-23

[English abstract of article by Zhang Yuezhong [1728 6460 0022] of Sichuan University]

[Text] By means of the surface Lagrangian and gauge invariant charge current, we present a detailed discussion of the physical meaning of each quantity in the boundary condition of dyon-fermion dynamics. It is shown that adding the surface Lagrangian to the system is equivalent to selecting a suitable boundary condition. By gauge transforming the Lagrangian by a charge generator, we get a corresponding $U(1)$ charge current density which is both gauge invariant and spherosymmetrical. Use of the canonical method and careful treatment of surface terms show that the S-wave Hamiltonian given by Yamagishi requires amendment by a surface energy term.

PARTICLE DENSITIES AT THE CENTER REGION IN HIGH ENERGY HEAVY-ION COLLISIONS

Beijing GAONENG WULI YU HE WULI [PHYSICA ENERGIAE FORTIS ET PHYSICA NUCLEARIS]
in Chinese Vol 10 No 1, Jan 86 pp 57-62

[English abstract of article by Lu Shiqi [4151 0013 3825] and Zhao Weiqin [6392 4850 0530] of the Institute of High Energy Physics, Chinese Academy of Sciences]

[Text] Based on the two-chain model by A. Capella, et al., the rapidity distributions of the multiplicity in high energy heavy-ion collisions, especially in head-on collisions, are discussed. The energy density at the center region in head-on collisions is estimated for different incident energies and different heavy ions. It is shown that the condition of the phase transition to the quark-gluon plasma can be realized in heavy-ion collisions at several tens of GeV.

STUDY OF α -EMISSION INDUCED BY ^{16}O ON ^{27}Al

Beijing GAONENG WULI YU HE WULI [PHYSICA ENERGIAE FORTIS ET PHYSICA NUCLEARIS]
in Chinese Vol 10 No 1, Jan 86 pp 63-67

[English abstract of article by Zhan Wenlong [6124 2429 7893] and Shen Wenqing [3088 2429 1987], et al., of the Institute of Modern Physics, Chinese Academy of Sciences, Lanzhou]

[Text] The α -particles induced by 84.5 MeV and 62 MeV ^{16}O on ^{27}Al are measured using a ΔE -E semiconductor telescope. The energy spectra, angular distributions, contour plot of $d^2\sigma/d\Omega dE$ in the E - θ plane of the emitted α particles and the variation of the nuclear temperature with the emission angles are obtained. The mechanism of the direct α particles is discussed.

INFLUENCE OF THE NEUTRON NUMBER OF TARGET NUCLEUS ON CROSS SECTIONS OF
PARTICLE EMISSION IN $^{12}\text{C}+^{112},^{124}\text{Sn}$

Beijing GAONENG WULI YU HE WULI [PHYSICA ENERGIAE FORTIS ET PHYSICA NUCLEARIS]
in Chinese Vol 10 No 1, Jan 86 pp 68-74

[English abstract of article by Wang Dayan [3769 1129 1693], Jin Genming [7246
2704 2494] and Zhang Li [1728 4539], et al., of the Institute of Modern Physics,
Chinese Academy of Sciences]

[Text] The energy spectra and angular distributions of Li, Be and B particles
emitted from the $^{12}\text{C}+^{112}\text{Sn}$ and $^{12}\text{C}+^{124}\text{Sn}$ reactions at $E_L = 70.0$ MeV are
measured. The angular distributions of the Li, Be and B particles are found
to be peaked around the grazing angle, without any forward peaked component.

The experimental results also show that the cross section for emission is
larger in the $^{12}\text{C}+^{112}\text{Sn}$ reaction than in the $^{12}\text{C}+^{124}\text{Sn}$ reaction, in contrast
to the cross sections for Li, Be and B emissions. This indicates the effect
of the neutron number of the target nucleus on the emission probability.

PROTON AND NEUTRON SUBSHELLS AND THE INTERPLAY BETWEEN THEM. II. RARE EARTH REGION

Beijing GAONENG WULI YU HE WULI [PHYSICA ENERGIAE FORTIS ET PHYSICA NUCLEARIS] in Chinese Vol 10 No 1, Jan 86 pp 92-97

[English abstract of article by Zhang Jingye [1728 2417 2814] and Li Baoan [2621 1405 1344], et al., of the Institute of Modern Physics, Chinese Academy of Sciences, Lanzhou; and Zhang Mengzhong [1728 1125 0022] of Lanzhou University]

[Text] Based on the experimental data of even-even nuclei in the rare earth region, further study of the interplay between subshells of two kinds of nucleons has been carried out. Emphasis is placed on the characteristics and N, I dependence of the Z=64 subshell. A theoretical explanation is given in terms of the Nilsson diagram and a simplified calculation of n-p interactions.

9717
CSO: 4009/58

END